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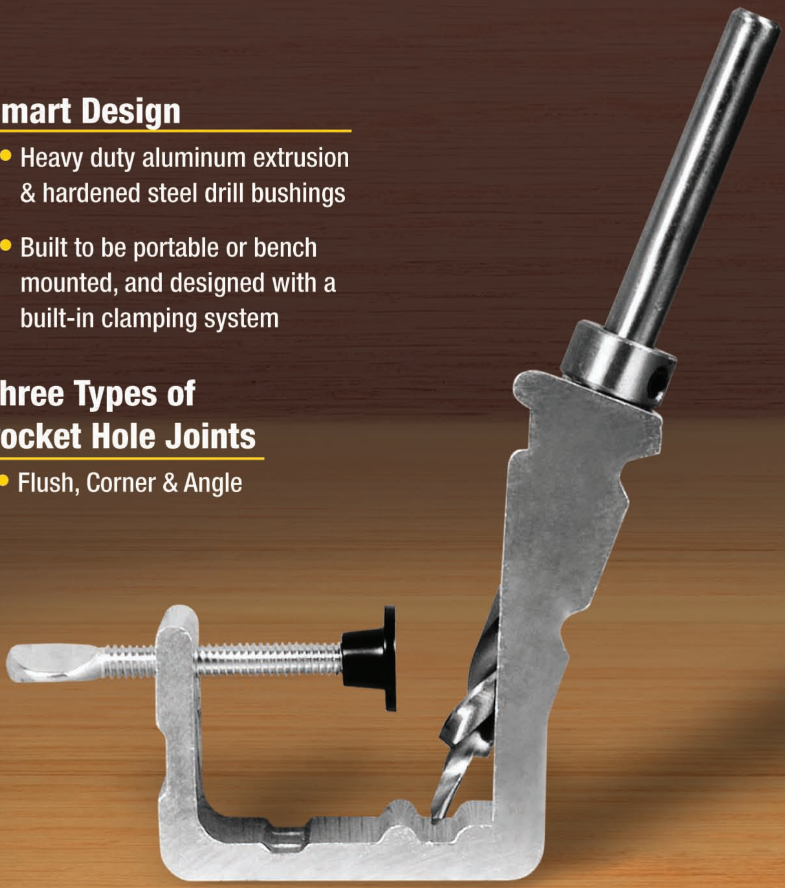
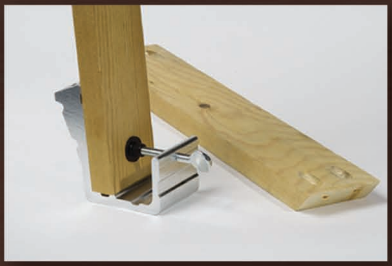
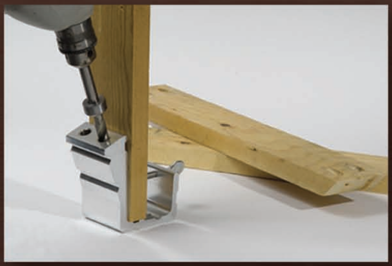
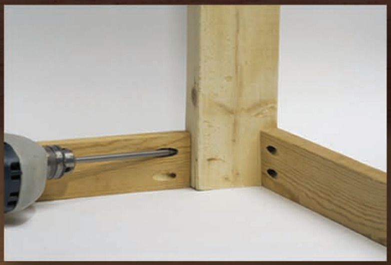




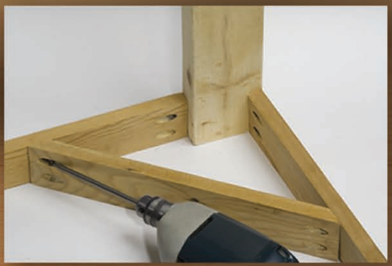
Clamp wood in jig



Drill into pre-aligned holes



Assemble flush & corner joints



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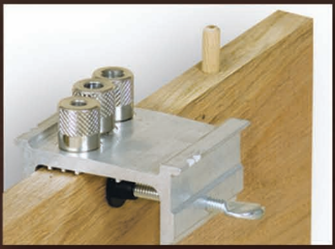

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LETTER
From The Editor-In-Chief

As we approach the cold season of winter, the good news is that energy prices for gas and heating oil have fallen in recent weeks. The bad news is that much of the global economy has fallen, too, leaving smart homeowners with plenty of reason to make their home as energy efficient as possible. Winter requires a balancing act between saving utility costs and keeping your family warm and comfortable. Fortunately, there are a few simple weekend projects to protect your home from the big chill.

One of the easiest and cheapest chores is to seal your home with caulk. While not a very exciting weekend activity (I personally hate to apply caulk), it's a necessary evil to seal the cracks and crevices where warm air escapes and cold air infiltrates. In fact, if you were to measure the total space of the cracks, gaps and holes around the exterior of the average home, you might find that "hole" equates to a few square feet of open space, sucking away your energy dollars like a greedy black hole. Check all window and door casings, as well as plumbing and electrical connections where wire, cable and pipes enter the home. For large gaps, apply an expandable foam sealant. For smaller areas, use weather stripping or a high-quality caulk, because the cheapest varieties are harder to work with and quicker to fail.

Leaking air ducts present another problem. Ductwork that leaks conditioned air into an unfinished attic is a major waste of energy. If you find a leak, seal it with duct mastic or aluminum foil tape. Although TV's MacGyver would use duct tape to make everything from a catapult to a cake, the stuff is surprisingly not the best choice for actually sealing air ducts.

And, simply changing your air filters can allow your HVAC system to operate more efficiently. When a forced-air system doesn't have to struggle through dirty, clogged filters, it can warm the house much more easily.

Another potential DIY job is to add a layer of insulation to your attic. Fiberglass insulation that comes in rolls or precut batts can be laid by hand and stapled in place as needed (wear eye and respiratory protection). A rule of thumb is to have at least 12 inches of insulation covering the rafters in the attic.

And a quick fix to optimize your HVAC system is to install a programmable thermostat. When these units are programmed to lower the temperature while the home is unoccupied, you can trim your heating costs by as much as 10 percent. For a step-by-step guide to upgrading your thermostat, as well as tons of other helpful home maintenance articles, visit www.extremehowto.com.

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A: Ultraviolet rays are the reason people wear sun block in the summer. In the same way that those rays can be harmful to our skin, they can also be harmful to other biological organisms. The UV rays can penetrate cells and damage their molecular bonds. A UV light works the same way, improving indoor air quality by radiating harmful bio-organisms that live in the home's air and duct work. When installed in an HVAC system, not only does a UV light render these microorganisms harmless, including mold and mildew, it prevents these organisms from reproducing. The overall effect of using a UV light in your ductwork can benefit your health as well as your budget, because it also inhibits these unwanted organisms from growing on coils, which can restrict airflow.

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Q. *What's wrong with my garage door opener? The automatic opener was installed by the previous owner. It worked fine for a couple of weeks, then the door quit shutting all the way, returns to the "open" position, and the motor starts flashing lights.*

A. The culprit could be a variety of problems, but the flashing lights are a common diagnostic feature used by several manufacturers of garage door openers. If the previous homeowner left behind a manual, refer to the troubleshooting section; the specific number of flashes is usually indicative of the problem. For example, one flash could indicate that a certain wire is misaligned. Six flashes could indicate that the motor circuit has failed. If you don't have a manual, contact the manufacturer regarding the flash code. Some manufacturers even have the flash code posted online to help pinpoint the problem.

……

Q. *The caulk in my bathroom keeps developing black mold. I keep bleaching it, but the mold comes back. Is there any better way to kill the mold?*

A. It sounds like someone used the wrong type of caulk for a bathtub. In this case you should completely remove all of the caulk. Use a putty knife or a 5-in-1 tool to cut and scrape away the caulk. Clean the remaining film with a rag and some bleach. Buy a Tub & Tile Caulk intended for kitchens and bathrooms, which has an added mildewcide to resist mold and mildew. Apply a continuous bead along the caulk joints, and smooth it with a wet finger or dowel. The wetness will allow it to glide over the caulk bead to smooth the joint. It may help to wrap your finger in a wet paper towel, or even mask the caulk bead with painter's tape for a uniform joint. **EHT**

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Cordless Fastening in Tight Spots

By Charlie Self

Every house has its nooks and crannies where there's trouble inserting a screwdriver, or power driver, to drill holes or drive fasteners in spots where they are needed.

Driving a screw with an anvil may sound a bit off-the-wall, but that's what impact drivers do. A tiny anvil strikes, internally, to drive the screw so quickly that much of the time it seems to melt into the work. Little pressure is needed on the head of the tool—just enough to keep it in the screwhead slots (aim for square-drive, Phillips and Torx heads to reduce cam out). Some tools offer as many as 3,200 IPM (Milwaukee's 2650-22), or impacts per minute, while Ridgid's right angle model kicks in at 3,100 IPM. Bosch's 10.8-volt PS10-2, with its articulating head (usually at a right angle), offers an impressive 3,000 IPM.

Ridgid's 18V impact driver uses both li-ion and NiCad batteries.

DO YOU NEED YET ANOTHER TOOL?

Whether or not you need an impact driver depends on what kind of work you do, or intend to do, around the house, shop and elsewhere. To ease tight corner chores, there are plenty of compact impact drivers.

Impact drivers (IDs) don't work supremely well for drilling. The anvil strike at 2,000+ times a minute isn't ideal, on top of which it requires a hex head on the bits, or a hex adapter, both readily available in most hardware stores. Drilling can be done, but it's not the main aim of the tool. In tight spots, though, IDs are a wonder, drilling or driving.

Impact drivers also work well as small impact wrenches. However, use impact sockets, because regular sockets shatter.

Where impact drivers really shine is at running in long (2-1/2- to 3-inch) deck screws, and driving ledger board lag screws rapidly. (Although, the 9.6- and 10.8-volt models don't do well at this heavier work).

The powerful torque means slotted screws are best avoided. Generally, only light pressure is used on the driver, just enough to keep it firmly in the screwhead opening without cam (torque) out. Slotted screws don't have enough gripping surface to handle the torque.

Impact drivers work exceptionally well on any screw that gives a good friction fit. With pilot holes, they drive Tapcon anchor screws in concrete quite well.

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IDs are not a substitute for a standard drill/driver or hammerdrill. They are drivers, and very effective at what they do—the younger siblings of impact wrenches. Contractors love them; heavy-duty DIYers love 'em, too. The better ones are pricey. Lithium-ion is available for most and is a touch more costly, but is well worth it. Lithium-ion batteries are often backward compatible with NiCads.

Impact drivers are many times noisier than drill/drivers. I strongly suggest you try a couple to see if the chattering ratchet noise is too great, before deciding to buy any model.

Hitachi offers impact drivers in two sizes, 14.4V and 10.8V.

WHAT'S OUT THERE

Prices range from a low of about $129 for the Ridgid right angle to more than $300. More costly versions are often better handling, more durable, more powerful, less likely to spit and sputter along the way. The Ridgid, though, is not a low-end tool.

A plain ol' clutched cordless drill is fine for turning the few screws most of us need. What changes the equation is a need for resurfacing a deck, building a deck, hanging ledger boards, installing doors, or installing anything that uses a fair amount of screws.

Though the cordless ID is

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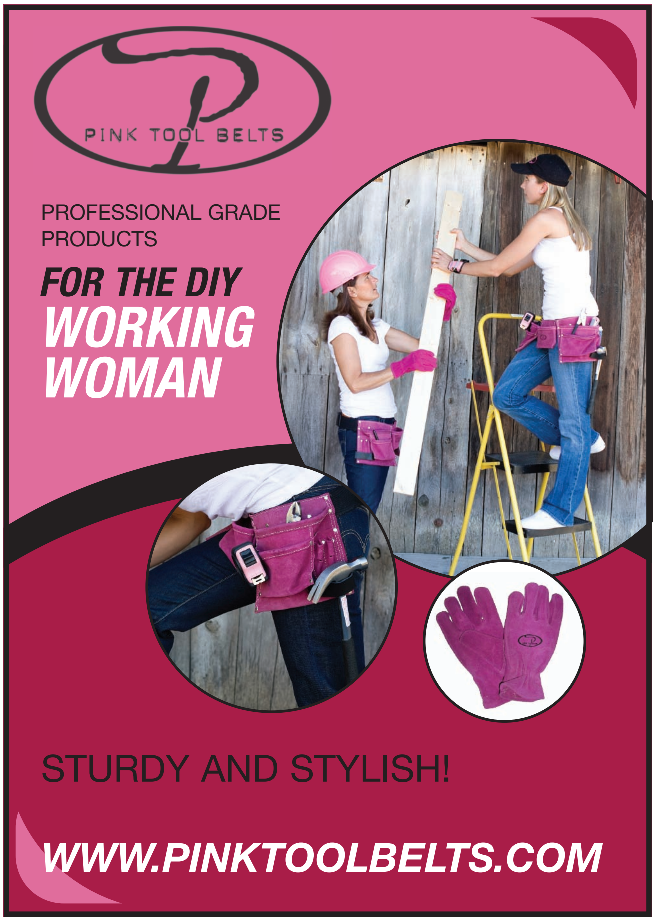
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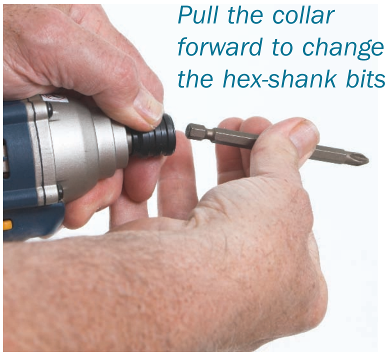
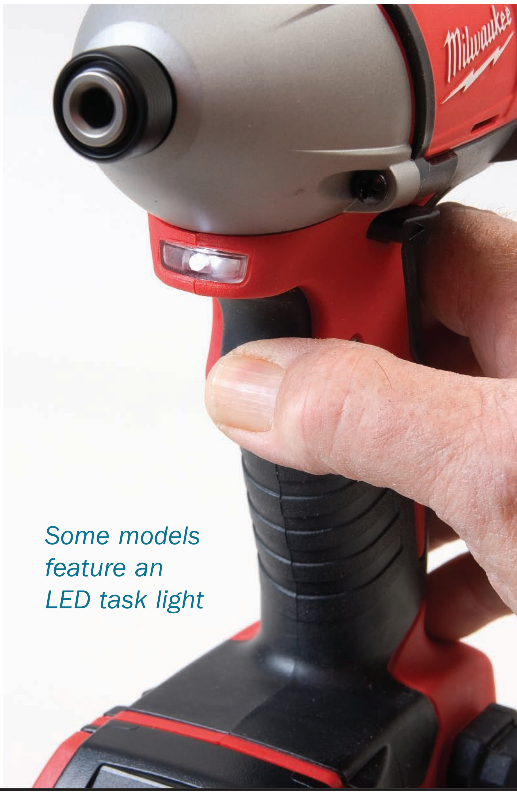


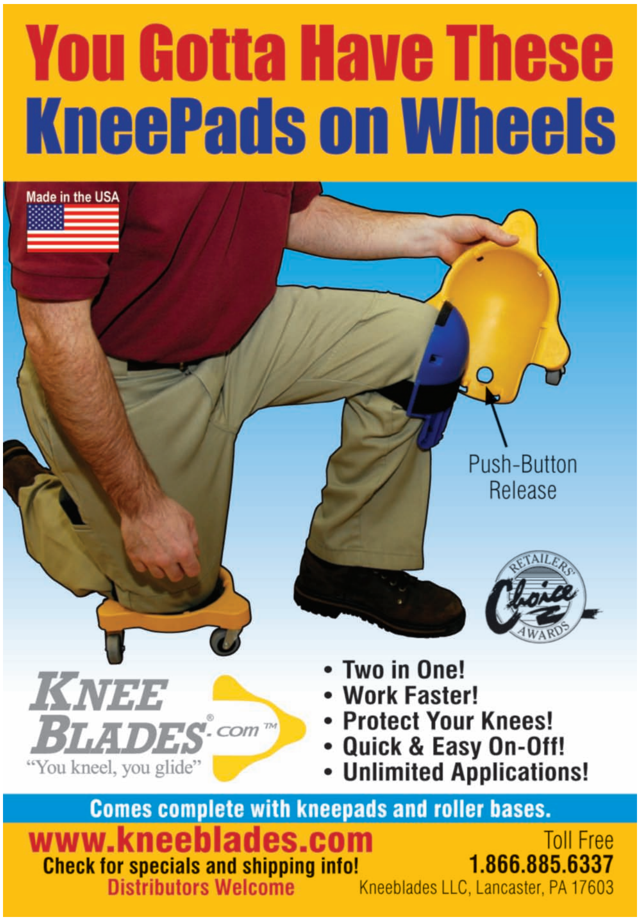
Pull the collar forward to change the hex-shank bits.

heavy compared to a screwdriver, and only a bit lighter than a cordless drill of the same voltage, there the comparison ends. Place the bit in the driver, then put the bit into a 3-inch screw head, hold firmly and squeeze the trigger. Seconds later, repeat the process with the next screw, and move on down the line. Pushing the head of the impact driver into the screwhead with more pressure doesn't do anything but tire out the user.

The small 10.8-volt models from Bosch and Hitachi, the 9.6-volt from DeWalt and the 12-volt right angle from Ridgid, can get into some unbelievably tight spots, and all have compact heads just a few inches long. They're useful for hanging cabinets in tight areas when there's little internal room in the cabinet. Think of a 12-inch deep cabinet going in a corner where a screw needs to go in at a slight angle to make sure you hit a stud. The fact that no extra pressure is needed to drive screws makes IDs nearly ideal, easing some jobs that can make you crazy with hand screwdrivers, or that can't be done with a



Some models feature an LED task light



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drill/driver. As an example, the Hitachi head is only 5-3/4-inch deep. Add a 3-inch long screw, and you can still easily fit the unit into a standard 12-inch deep cabinet (more like 10-1/2 inches of actual inside depth).

These tools are not wrenches, but drivers meant for installing and removing small fasteners easily as when building a deck, fence, or installing cabinetry. Impact wrenches are their big brothers, and run larger fasteners in and out, such as vehicle lug nuts. But the impact drivers are powerful enough to drive almost any screw, lag screw or nut within a reasonable size range. I've been told by deck builders that they're fantastic for running nuts onto carriage bolts when building decks, saving an incredible amount of time and energy. They also speed up lag screw installation appreciably.

We looked at a number of cordless types, from 9.6 volts to 18 volts, with and without the newest lithium-ion (li-ion) technology.

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Featured Articles

Building Sawhorses
There are as many uses for sawhorses in the workshop as there are plans to build them. This fairly common design results in sturdy sawhorses that nest for compact storage. What's different is they're made from plywood scraps stacked together to create the joints. Read more...

Automata: A Fascinating Woodcraft
Automata making is a mechanically oriented form of woodcraft, often made to amuse and entertain the viewer. The finished product is usually a hand-cranked object or mechanical sculpture that ranges from the simple to the complex and imitates the actions of a living creature. Read more...

Discovery in a Tree Trunk
One of Combermere, Ontario's most interesting artifacts was discovered only because a natural disaster battered the small town two years ago. Amid the many damaged trees was a relic that now draws curious tourists every season, but the lucky find almost didn't happen. Read more...

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CORDLESS WINS AT HOME

For this review we looked at a bunch of fastening tools, including a cordless drill or two in the mix (see sidebar).

DeWalt's drivers are single speed. The Milwaukee has one speed listed in RPM (2,200), and the other in impacts per minute (IPM) at 3,200. Bosch offers a similar listing on both its PS10-2 and its PS40-2, with 1,800 RPM and 3,000 IPM (Bosch calls it BPM, or blows per minute).

Milwaukee's 2650-22 is a lithium-ion powered tool, very comfortable to hold and use, even in an 18-volt version. Lithium-ion batteries are a great change for the handyman or handywoman, offering more power in a small, lighter battery. The battery may be as much as 40-percent lighter than comparable NiCad batteries, has more amp hours and more endurance. We weighed the 18-volt DeWalt batteries. The lithium-ion battery is a full pound less than the NiCad. It is considerably smaller as well. Plus, run time is considerably longer than the NiCad. Recent claims for similar top-of-the-line batteries include 2,000 recharges.

Ryobi's P230 offers one speed range, as does the Craftsman 11483, while Hitachi has two speed ranges in the 14.4-volt, along with an LED light and a belt hook. The 10.8-volt Hitachi offers a single speed, 2,300 impacts per minute and maximum torque of 930 inch-pounds, making it suitable for tightening bolts from 3/16 to 15/32 inch. It does fine with 3-inch screws, but is not as fast as the more powerful drivers, nor does it drive nearly as many screws.

Bosch 10.8V PS240-2 offers 800 in/lbs of torque in a compact package.

Bosch works its way in with two small models, both 10.8-volt lithium-ions. The PS40-2 is a standard T grip, while the PS10-2 has a head that articulates to five different points, from right angle to straight out. It is the handiest of all for those who consistently work in confined spaces. As a bonus, the PS10-2 offers a seven position clutch to prevent overtightening.

Ridgid's well made right angle ID has a fixed head, comes with NiCad batteries, handles quite well and, overall, is excellent in tight spaces. It is heavier than the Bosch 10.8 articulating head ID, as well as considerably larger overall, though only fractionally

DeWalt offers lighter duty 9.6V and heavy-duty 18V versions of its impact drivers.

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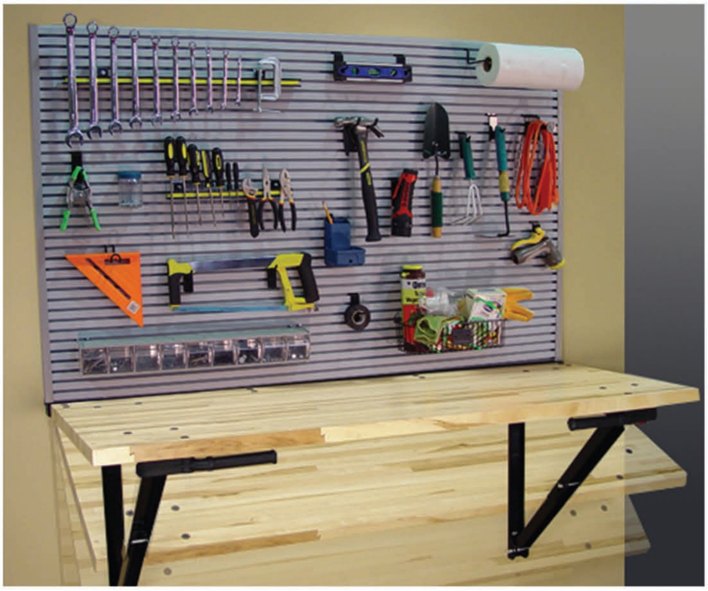

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Every tool works well within a fairly tight space. The Ryobi head is the longest at 7-1/8 inches, while the Ridgid right angle, at 3-1/8-inch is the smallest, with the Bosch PS10-2 striking along behind the Ridgid at 3-5/8 inches. The others all drop somewhere in that area, with most right around 5-1/2 inches, slightly above, or slightly below.

WHICH ONE IS BEST?

Our series of impressions was gained in short bursts of use; it's not really sensible to compare DeWalt's 9.6-volt model or Bosch's 10.8-volt to Milwaukee's (or DeWalt's or Ridgid's) lithium ion 18-volt models, or, in fact, with the Hitachi 14.4-volt li-ion.

Compact heads make it easy to maneuver impact drivers in confined work spaces.

For heavy-duty fastening of screws in deck or fence building, or lag screwing, or carriage bolts on ledger boards, any of the 18-volt impact drivers with lithium-ion technology serve well. Lithium-ion is a bonus, as NiCad does fine. All the 18-volt tools we looked at came with a charger and two batteries (except the Craftsman, Ryobi and Ridgid—more on this in a bit). All will serve a homeowner for years, working well and effectively.

All of the tools handled easily, and were controllable when running in 1-inch screws, as well as 3-inch. Weight varied between tools. The right angle heads were slightly more difficult to control with very long screws.

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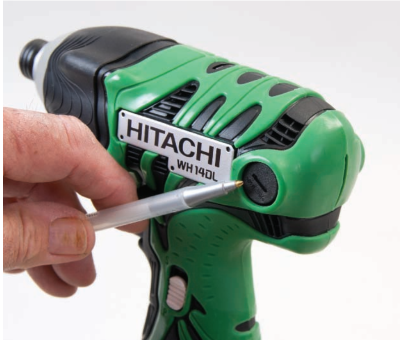
Craftsman has a system similar to Ridgid and Ryobi, using either NiCad or li-ion batteries (19.2 volt), one battery for use in several tools. The battery is sold with the charger for the Craftsman C3 system. The tool has the usual LED, 1/4-inch quick change hex chuck, turns out 0-3000 IPM, and produces 900 inch-pounds of torque.

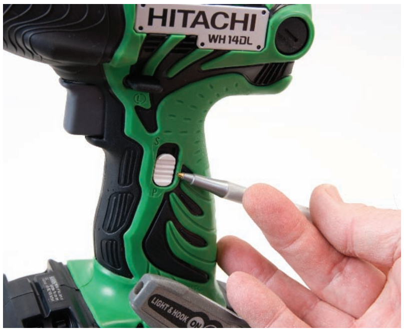
Hitachi provides the only 14.4-volt tool, another lithium-ion model, and a tool that does everything the 18-volt tools do, though not as long. I liked the handling on the Hitachi a great deal, with its lighter weight. I'm not dead sure about the placement, or control, for the LED. It's on the tip of the resin belt hook, with its own off/on buttons—something that might create a problem for forgetful types. Leave the LED on when you stick the driver in its case, and the battery may run down before you open the case again. Otherwise, the tool was an exceptional handler, with the most easily selected two-speed range—a switch on the side of the tool.

Hitachi's 10.8-volt was a surprising performer. It was light, with a li-ion battery, a 5-5/8-inch long head, an LED set under the chuck, and a single speed range, controlled by the trigger.

DeWalt's two models provide a widely varying look at needs. The DeWalt 9.6-volt ID is lightweight, very small, easy to handle, and well made. It lacks all excess weight, but ranks at the bottom regarding the number of possible screws or bolts driven, because of the 9.6-volt battery.



Hitachi's 14DL has easy-to-change brushes and a two-speed switch.



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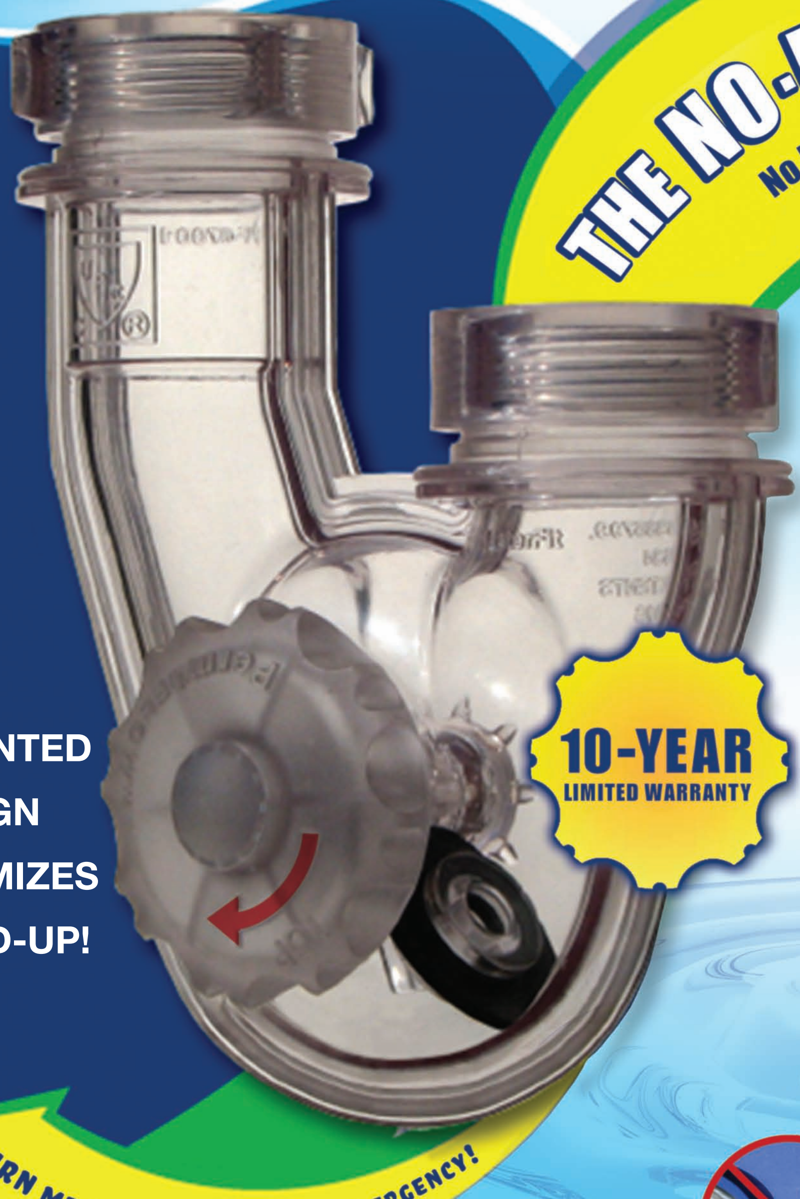

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Milwaukee's lithium-ion 18-volt vies with the DeWalt 18-volt for power, is light and handles beautifully for all its power. Milwaukee claims a 2,000-charge capacity for its lithium-ion batteries, a factor in its favor if you're using the tool heavily, daily. Batteries have run-time gauges. Milwaukee claims torque of 1,400 inch-pounds.

Craftsman's 19.2V ID offers 900 in/lbs of torque.

Ridgid's full-size ID offers a choice similar to Ryobi's, a single battery for several tools, but it adds one point: a 24-volt battery also works in the R8823. The 18-volt is available as lithium-ion and in NiCad. The 24-volt is lithium-ion only. The tool has the standard LED, a variable speed switch, the usual 1/4-inch hex chuck, and excellent handling. The 12-volt right angle is not lithium ion, but is powerful enough for its chosen chores.

Earlier, we mentioned Ryobi's battery/tool set up. A few years ago, Ryobi launched the ONE+ system; one battery can be used in many tools, thus freeing the purchaser from buying a battery and charger at every cordless tool purchase. Ryobi's lithium-ion and NiCad batteries are interchangeable, from tool to tool and charger to charger. During checks, I found the li-ion claims to be solid, so Ryobi's 2X performance claims are probably low. Certainly the claim of 20-percent less weight is true. Ryobi's tools are low cost, on the edge of high performance and quality, so often they're bargains for those trying to keep from being nibbled to death by the tool ducks of the world.

The Ryobi P230 operates on the interchangeable One+ battery system.

COMFORT GRIP

A great feature of newer tools, corded and cordless, is the soft cover. In the good old days, you gripped bare aluminum (or steel if you're older than I am), with a two-wire system that had iffy insulation on the wires. On very cold and very hot days, handling

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Bosch	PS10-2, 2 batts.	10.8	li-ion	800	Articulated right angle	$190
Bosch	PS40-2, 2 batts.	10.8	li-ion	800	T (modified pistol grip)	$165
Craftsman	11483 Diehard, (no batt.)	19.2	li-ion	900	T (modified pistol grip)	$74.99 (battery and charger, add $99.99) + shipping
DeWalt	DC855KA, 2batts.	9.6	NiCad	960	T (modified pistol grip)	$270
DeWalt	DC825KA, 2 batts.	18	NiCad/Li-ion	1,330	T (modified pistol grip)	$315
Hitachi	WH10DL, 2 batts.	10.8	li-ion	930	T (modified pistol grip)	$220
Hitachi	WH14DL, 2 batts.	14.4	li-ion	1,240	T (modified pistol grip)	$295
Milwaukee	2650-2, 2 batts.	18	li-ion	1,400	T (modified pistol grip)	$325
Ridgid	R822332	12	NiCad	800	Right angle head	$129
Ridgid	R8823, (no batt.)	18/24	li-ion/NiCad	1,490	T (modified pistol grip)	$117 (+batt, lion and charger @ $150)
Ryobi	P230, (no batt.)	18	li-ion/NiCad	1,200	T (modified pistol grip)	$69 (li-ion batt and charger add $119, batt alone $89)

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tools was torture. Today, we've advanced into plastic bodies, blow-molded accurately. Improvement continued so that in the past decade or so, a soft-touch plastic coating that feels much like soft rubber is used on most tools. On cordless impact drivers, you'll find it on every tool. The tools are more comfortable in the hand because of it (and some further research into ergonomic design), and less likely to spin or slip in the hand.

Bosch and Ridgid offer right-angle IDs.

The articulating head of the Bosch PS10-2 can be adjusted to drive fasteners at a wide variety of angles.

HOW TO BUY

Start with a work check. Do you have a few dozen long screws to drive each month? Each week? Each day? Do you see yourself driving lag screws? Do you do a lot of heavy work around the house? Are you likely to install your own cabinetry? Will you be building a deck, a porch, a workshop, anything major in the next short period of time?

The more you have to do, over a long or short period of time, the more it makes sense to spend for the more power of a professional-grade tool. If you're looking for short-term use, heavy but only for a week or two, or light- to medium-duty over a course of years, then go for the mid-range tools described here.

If you've just got a couple dozen screws to drive, forget about an impact driver, and stick with your drill/driver. Even consumer models cost over $100, and the best models punch the lights out of three $100 bills. **EHT**

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For anyone who decides either the cost or the noise of an impact driver is too great, there are three excellent choices for drills or screwdrivers to work in those tight corners.

The smallest, Skil's little iXO is a 3.6-volt lithium-ion screwdriver and is one of the best selling power tools of all time. It comes with a set of 10 driver bits, will also drill with the proper bits, and includes a right-angle attachment. Performance is impressive when compared to size, offering a speed of 200 RPM.

Ryobi and Craftsman offer right angle drills in full size, with many similar features. They're about the same height and weight, both have large easy-to-use switches, and both are easily reversible. Both use speed-control triggers and have 3/8-inch chucks. The Craftsman has a built-in LED for those tight niches, while the Ryobi doesn't. But the Ryobi has a rotating foot to allow easier clearance in odd-shaped spaces. Both come without batteries, accepting their own brands of lithium-ion batteries. Look for top speeds of 1,050 RPM with the Craftsman and 1,000 with the Ryobi, which make them very versatile. Craftsman gets $64.99, minus battery and charger, for its right angle, while the Ryobi goes for $64.97 at Home Depot, without battery and charger.

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Install Mosaic Floor Tile

By Matt Weber

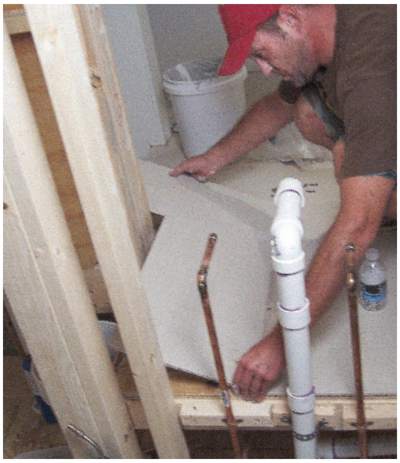
Mosaic tile is a combination of tiny colored tiles called “tesserae” that can be used to create a pictorial or geometrical design to decorate a home’s interior. A single color can be used for a plain design, two complementary colors are a more popular option, or use many colors for a complex pattern. With the many small tiles the installer can play the role of artist, using the individual units like blocks of color in a painting. With enough time, work and patience, tile professionals can use a wide variety of colors to create an intricate floor or wall that rivals the craftmanship of Roman times, when mosaic tile was a favored medium for historic murals.

However, the painstaking chore of assembling mosaic tile piece by piece is a task best left to the pros. For the do-it-yourselfer, a faster and easier method is to use larger tiles that consist of many individual tesserae attached to a scrim backing in a prearranged pattern. The scrim backing can be cut to size with shears and allows the tiles to easily adhere to the floor. The repeated patterns of tesserae can be used over large areas to achieve the look of a complex design. The tesserae are usually made of glazed ceramic, which makes them water-resistant and a preferred material for areas such as bathroom floors, as shown in this article.

PREP AND PLAN

The first step in installation is to remove any existing floor covering and ensure the subfloor is clean, smooth and flat. If necessary, level concrete floors with a leveling compound.

On the project in the photos, professional remodeler, Jeff Davis, opted to cover the bathroom subfloor with precut HardiBacker cement board. HardieBacker is both mold and



Cement board is installed over the plywood subfloor and screwed down securely.

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moisture resistant, which is ideal for tile installation in wet areas. Davis fastened the cement board to the plywood subfloor with deck screws every 8 inches in the designated screw holes that are printed on the face of the HardiBacker.

Next, map out a floor plan to determine how many tiles you'll need. Then, lay out the first couple of rows in a dry run, temporarily taping the tile joints with masking tape, if necessary. Snap a couple of intersecting chalk lines at right angles on the backer board, marking the joints of the first row of tiles. The chalk lines will serve as a guide for placement of the first rows.

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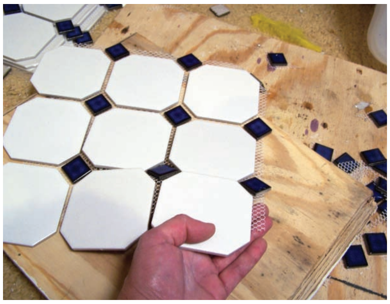
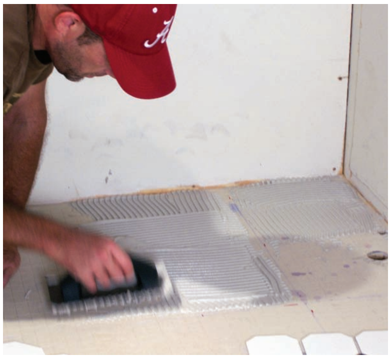
When you're satisfied with your layout, remove the tiles and pour a little thinset mortar in the corner of the intersection of your first two rows. Use a notched trowel to spread the adhesive, combing it slightly to create ridges in the mortar bed with a depth of about 1/4 inch. Place the tiles in the mortar bed, keeping them in line with the chalk lines. Slightly twist each tile as you install it to embed the scrim for a better bond. Continue laying adhesive and tiles across the room, using a floor level to make sure the tesserae remain flat



This type of mosaic tile is attached to a flexible scrim backing for easy installation.



After planning your layout, spread mortar onto the cement board with a notched trowel.

and level. Davis suggests starting at the far corner of the room and working toward the door so you don't "trap" yourself with the new flooring.

If the individual tesserae blocks are uneven, then lift the tile and adjust the mortar bed beneath it. And, although scrim-backed mosaic tile is designed to be "self-spacing," Davis notes that the flexible nature of the scrim can cause the small tiles to shift slightly out of position. When this becomes an issue, he uses standard tile spacers to keep all the joints consistent.

For edge tiles, you can cut the scrim right along the tesserae joints with scissors, shears or a utility knife. Use construction paper to make templates for fitting tile around pipes, vents and

As you apply the tile, give it a slight twist to set it in the mortar bed.

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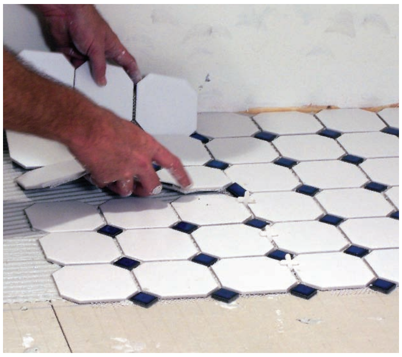

It may help to use plastic tile spacers to keep grout joints consistent.

other obstacles. You can cut out individual tesserae as needed, and tile nippers can be used to make partial cuts of the individual blocks. When installing the cut tiles, be sure to allow for the 1/8-inch grouting joint around walls or obstructions.

Try to avoid walking or kneeling on newly laid tiles. Clean off excess adhesive with a damp sponge as you move along, so it doesn't harden on the tile surface as it dries. Once all tiles are in place, allow the floor to set overnight.

GROUT THE JOINTS

The following day, Davis used a power drill and paddle attachment to mix up a batch of polymer-modified, sandless grout for the new floor. Manufactured by MAPEI, the Keracolor U grout that Davis used contains BioBlock technology to protect against mold and mildew. Whatever brand you choose, make sure the grout is waterproof and mix it according to instructions—usually to a consistency similar to pancake batter.

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Unsanded Grout with Polymer
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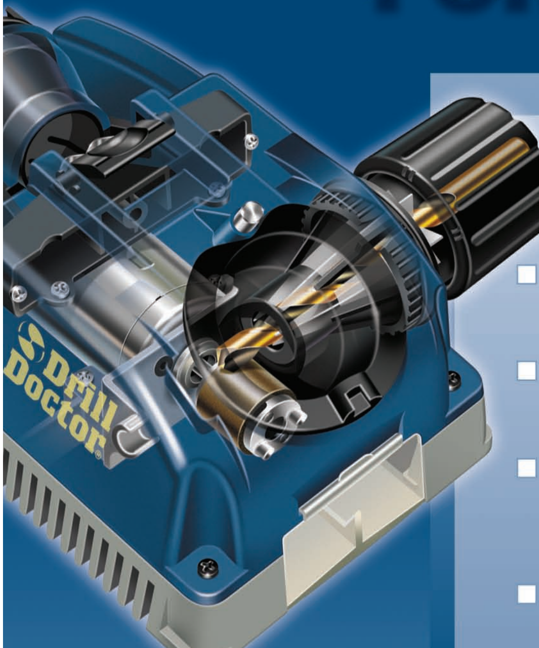

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Start in one corner of the room and apply roughly a pint of grout to the floor. Use a rubber grouting float to work it evenly into the tile joints. Holding the float at a 60-degree angle, press the edge down firmly to ensure the joints are filled completely. Apply the grout from one corner of the room toward the door, working with a pint at time and sponging up any excess as you go. Pull the sponge diagonally across the tile so it doesn't pull grout out of the joints. You'll need to keep a bucket of water handy to rinse the sponge often. Davis also suggests using a sponge that has an abrasive pad on one side for scrubbing grout loose as it begins to dry.

Once the tile is fully grouted, you can expect to revisit the floor two or three more times with a

Apply grout to the tile joints with a rubber float

The Keracolor grout from MAPEI is a polymer-based product with BioBlock technology to protect against mold and mildew.

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sponge and clean bucket of water. The grout will likely leave a film that will take a few attempts to remove.

SEAL IT UP

To fully waterproof a mosaic tile floor, use a mildew-resistant caulk to seal around pipes and bathroom fixtures. Allow the caulk to cure 24 hours before exposing it to water.

Many scrim-backed mosaic tiles come pre-glazed, but if that isn't the case, then the floor will require a sealer. If using unglazed mosaic, then seal the entire floor. First sweep away any dirt, dust or loose debris. Use a paint roller to apply a coat of tile sealant according to the manufacturer's instructions. Wait about a half hour after the application to clean up any excess sealant, and let it dry overnight. **EHT**

Editor's Note: *Jeff Davis is a professional remodeler located in Birmingham, Alabama, (205) 966-4813.*

Remove excess grout with a sponge and a bucket of clean water. Rinse and repeat until the film is removed.

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Here's a case study of repainting one home's interior to spruce up the décor and eliminate nicotine damage.

PAINT

After buying a house, it's common for new homeowners to update the interior with a fresh coat of paint. Color and décor help give the home a personal touch. However, when repainting our new house, my wife and I got more than we bargained for.

The fact that the previous homeowner had a respirator in tow when she signed the contract should have warned me of what I was about to encounter: Every inch of the interior was filmed with nicotine. The lady who had lived in the house for the previous thirty years had been an avid smoker. Not only is that habit bad for your lungs, it's also bad for your house, creating an odor and a dirty, sepia tinge to the entire interior. For example, there were several large, pale squares on the wall surface—these were places where pictures had protected the paint from cigarette smoke, so they remained several shades lighter than the rest of the damaged wall. We could wipe a paper towel over a window pane and come away with brown filth all over the towel. The whole house was fairly disgusting due to all the smoke damage.

To eliminate the odor and grime, we decided to prime and paint the complete interior of the house, ceilings and all … every square inch. It turned out to be a very big job. Here's how it went.

WALL REPAIR

Inspect the walls closely for damage, because little dents and dings have a funny way of showing up much more evidently after you've coated the wall in paint. Almost every wall will have imperfections from nail holes, furniture damage, cracking wall joints and more. If you're about to paint then take the opportunity to use vinyl spackling to fill all holes or cracks, allow it to dry and then sand flush with the wall.

We repaired the walls with Jigaloo, a three-part spackle kit in a can.

For minor imperfections, we used a new spackling product called Jig-a-patch (www.jigapatch.com). The product is basically spackle in a spray can. Just shake the can, aim the nozzle at the damaged area, and spray. Spraying the spackle eliminates the hassle of dipping it out with a putty knife. After about two minutes the spackle stiffens and you can spread it flat. Jig-a-patch includes a putty knife and a pad of sandpaper in the can, so the three components come as a self-contained kit. After the spackle dries, just use the abrasive pad to sand it smooth, then you're ready to prime. The product proved to be a real time-saver.

PRIME TIME

To eliminate any signs of nicotine damage, we needed a strong primer. And we needed it to do more than just prime the walls for the best topcoat color. We also needed our primer to block stains and seal odors. We opted for Kilz Complete (www.kilz.com), which is a powerful oil-based product that is specifically formulated to block odors, smoke, water and more.

A good rule of thumb when painting and priming is to always start at the top. In our case, this meant the ceiling. Ours was covered with popcorn-style, sprayed-on acoustical texture. Painting acoustical texture is usually very difficult, because the texture tends to crumble off the ceiling while you paint it. Under normal circumstances, we would have chosen to remove the ceiling texture altogether by dampening it with water and scraping off the melted texture with a trowel. However, the ceilings of this house had already been painted by the previous owner. Being encased in a coat of hardened paint meant that re-priming and repainting them would be easier than usual, while removing the texture would be more difficult than normal. We chose to repaint, using a long-handled roller with a very thick nap or pile on the roller cover, which works the paint thoroughly into the

Use a high-quality primer to seal out stains and odor.

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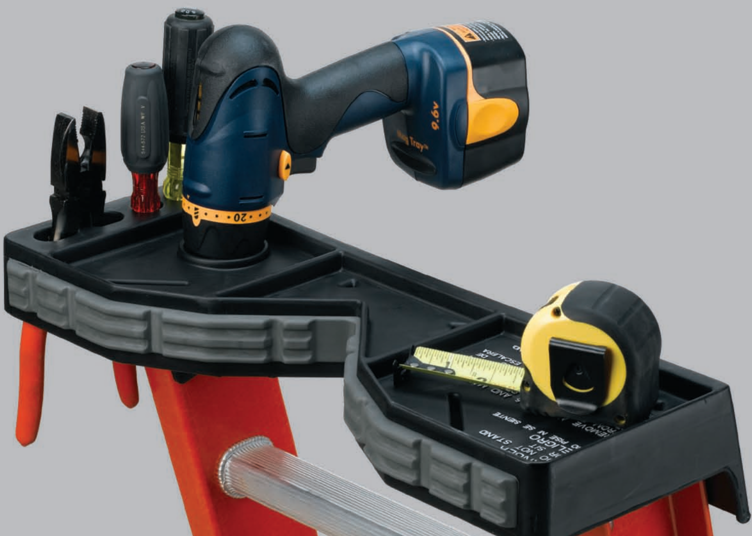

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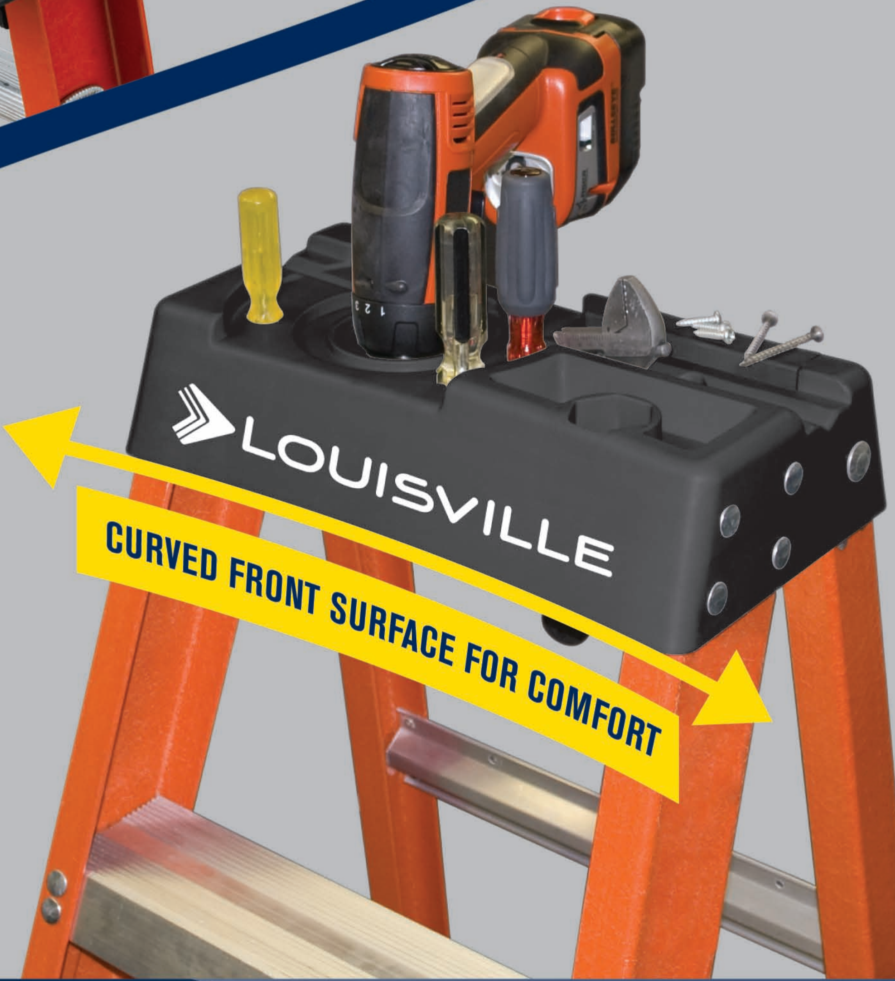

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1-(800)-666-2811 WWW.LOUISVILLELADDER.COM relief of the ceiling surface.

When priming or painting, be sure to cover everything you don't want painted with a plastic or canvas drop cloth. Don't skimp on the cheapest, thinnest plastic drop cloths, either. The thicker the plastic the more durable it is, and the better it stays in place without wadding up beneath your feet and exposing the floor or furniture beneath. If you're painting a large room, I'd suggest covering the entire floor with thick plastic and sealing the seams with tape. This will provide a tough, stationary layer of protection for all the work to follow.

Another suggestion for painting a ceiling is to have someone else do the work for you. My mother pitched in and did a great job painting our ceilings, for which I'll be eternally grateful. Go, Mom!

With the ceilings complete, we moved to the walls, using a roller cover with a shorter 3/8-inch pile to apply a stippled texture with less relief than what we used on the ceiling.

MASKING FOR COLOR

When priming and painting the walls, we used painter's tape to mask off all areas where one color met another, such as window or door trim, accent walls, etc. Applying tape is one of my least favorite aspects of painting, but what makes it worse is to find out after the fact that the tape didn't stick well, and the result is paint bleeding where you don't want it.

First, cut in the wall edges with a brush to facilitate better coverage with a roller.

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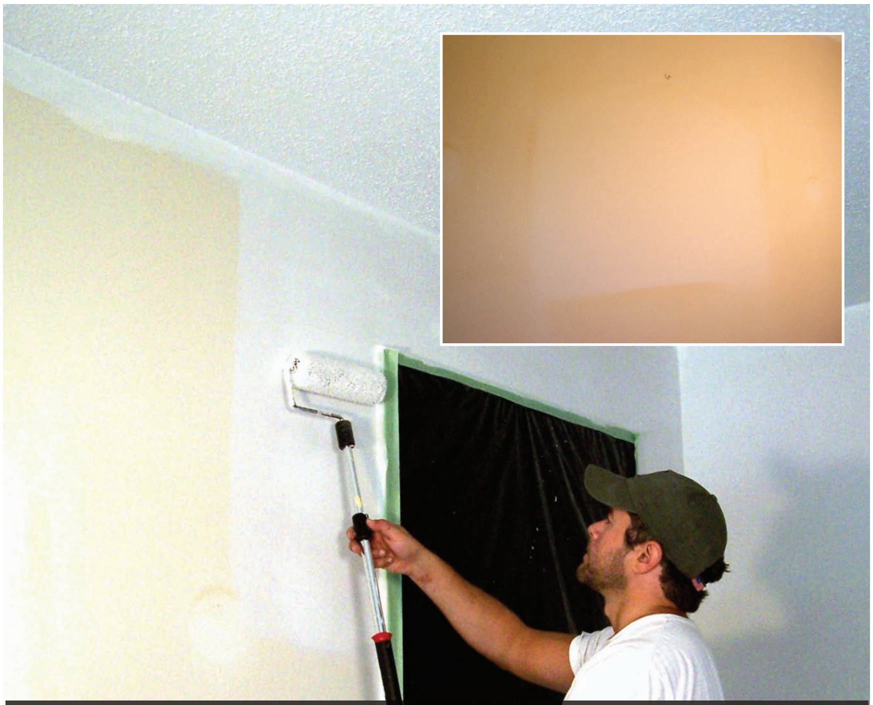
For this project we used two new products that helped conquer the taping process. The first is Frog Tape (www.frogtape.com), which is a specially formulated painter's tape that forms a chemical bond with the wall surface. Using Paintblock technology, Frog Tape is a patented crepe tape that forms a micro barrier along the edges of the paint when it comes in contact with latex paint. Unlike standard masking tape, which can easily lose its adhesion, the edge barrier of the Frog tape prevents bleeding for crisp, clean paint lines.

Another product operates on a similar principle. It's called Tape-Seal (www.perfectpaintlines.com), which is a clear acrylic gel. With this product you can use a standard economical grade of painter's tape by sealing the edge of the tape with the gel. To use, apply Tape-Seal with a dry paint brush at the edge of the tape, covering the edge of the tape and the surface you are about to paint. The Tape-Seal will bleed under the tape, which creates the seal. Once it is dry to the touch (10 to 15 minutes), simply paint right on top of it with your colored paint. The sealed barrier prevents the paint from bleeding under the tape, leaving a clean, sharp paint line.

Both products did their job very well. With Tape-Seal, an 8-ounce jar of gel goes a very long way—approximately 1,200 linear feet or 6 rolls of standard painter's tape. The rolls of Frog Tape are more expensive than standard masking tape but also eliminate the step of adding the sealer. My only gripe about either product is that once I ran out of my samples, I couldn't find replacement products of either brand in my area. Hopefully, distribution of both



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products will spread down here in the South.

CUTTING THE BORDERS

Before painting the entire wall, I always "cut in" the edges where the color will change, such as where the wall meets the ceiling, window trim, etc. By painting a border around the wall, you can apply paint with a roller, meeting that painted border for full coverage without trying to inch the roller all the way into the corner (which will inevitably smudge paint all over the trim or ceiling that you're trying to avoid).

Tape-Seal prevents the paint from bleeding past the tape.

The professional way to cut in is to draw a straight line that separates two colors using only a paint brush, with no masking tape or other aid. However, this takes some serious skill with a brush. According to some paint experts, it's best for these professionals to cut in while breathing out or holding their breath. If that sounds a bit too surgical, then do what I did—mask off the line with tape.

ROLLING, ROLLING, ROLLING

When rolling paint onto a wall, fill the tray no more than 1/3 full. Load the entire surface of your roller cover with paint, rolling it slowly back and forth so the cover absorbs. Use the tray's grid to prevent overloading. When painting walls, start at the top and work downward. I generally roll a large "W" pattern in a space about 3 by 3 feet. Then fill in between the gaps, blending into your initial strokes and spreading the paint evenly. Don't use too much paint on your roller, and don't concentrate coverage too much in one area. Too much paint results in unsightly runs that you will have to sand down and start over. When rolling, always work from the unpainted into the painted surface. Repeat the process when you start a new area.

Black & Decker's PaintStick eliminates the mess of loading your roller in a paint tray.

One new product that simplifies the rolling process is the PaintStick from Black and Decker (www.blackanddecker.com). This paint rolling system utilizes its handle like a huge syringe plunger. The system includes a cap for your paint can with a straw that reaches into the paint. Simply mount the handle of the PaintStick onto the straw and pull out the rear plunger in the handle. The PaintStick sucks the paint right up into the handle, completely eliminating the need (and mess) of a paint tray. To apply the paint, just press the handle, which forces the paint into a special perforated roller for easy application. An added feature of the PaintStick is that

PRO TIP FOR ROLLERS

One often overlooked step in a painting project is prepping the roller cover. All synthetic covers require some form of preconditioning to improve their performance. Before use in latex paints, rinse the cover with a faucet or garden hose, then spin it to remove excess water. Before using oil-base paints, the cover should be lubricated in the solvent used to thin the paint. Mohair covers should also be preconditioned in the solvent used for thinning. Preconditioning prevents the lack of paint release caused by the paint attaching to the fibers. However, lambskin roller covers have natural oils and don't require preconditioning.

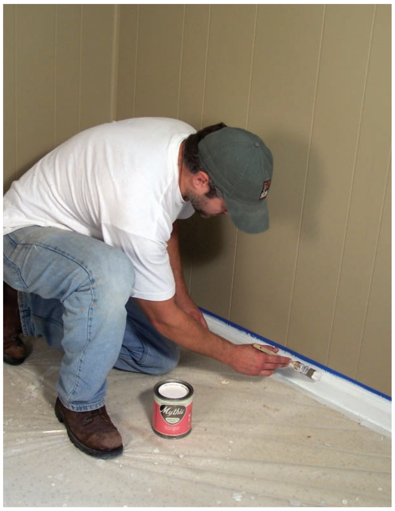
PRO TIP FOR BRUSHES

Although a paintbrush is a fairly simple tool, many DIY'ers don't use them as they were intended. When you see someone load a paintbrush, they usually dip the brush up to the metal band (ferrule) and then scrape the excess off on the lip of the can. This is a poor way to load a brush, causing paint to build up both on the brush and the sides of the can. When the built-up paint dries it turns into little chunks of hard paint that fall back into the fresh paint and end up as lumps on the wall. Here's the right way: First, dip the brush 1 to 2 inches into the paint. Then, gently tap the brush on the side of the can, first one side and then the other. The excess paint will stay in the can and leave you with a fully loaded brush for field painting or cutting in.

the handle can retract for use in tight spaces or extend for high, hard-to-reach areas.

TOUCHING UP TRIM

Window and door casing, baseboards, chair rails, crown molding—most homes have a lot of trim that needs attention. There's no special science to painting these areas, but in the long run you'll appreciate selecting a high-quality brush in lieu of a cheapo variety. Thinner, narrow brushes work best for trim. An angular sash brush is particularly handy for close-up trim work.



Frog Tape creates a chemical bond when it comes in contact with latex paint to prevent paint from bleeding beneath the tape.

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And most homeowners prefer a high gloss or semi-gloss paint finish on the trim for a little extra shine and durability.

If, however, you're replacing trim during your paint job, I'd highly recommend painting the new trim prior to installing it. Doing so will spare you the task of taping, reduce the likelihood of getting paint in unwanted areas, and limit the time you spend uncomfortably on your knees (i.e., painting baseboards in place).

After painting the trim, the inescapable chore of cleanup was the last phase of this whole-house paint job. It was a lot of work, but well worth the effort, as we had brightened the home with new, stylish colors and eliminated the grime of nicotine damage. Now, onto the next project… EHT

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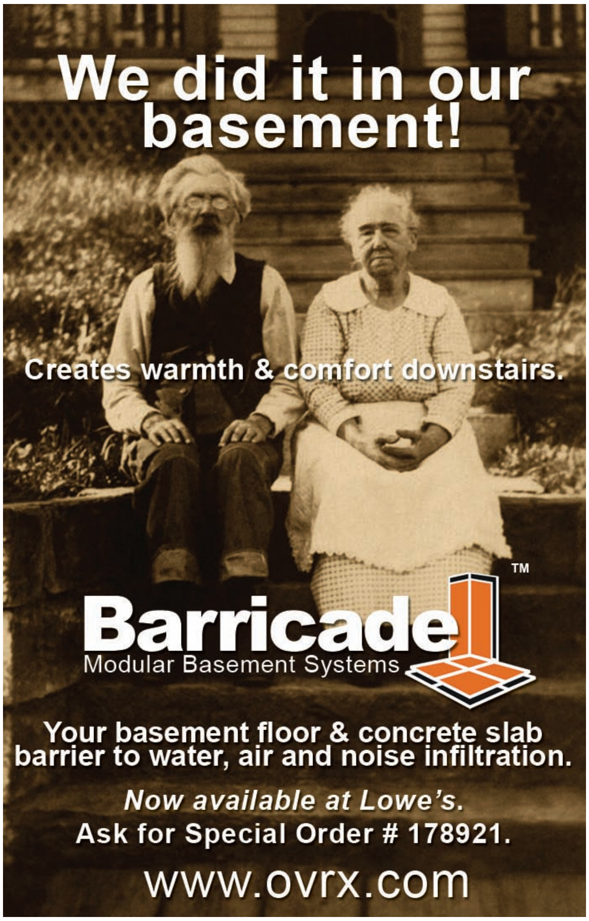
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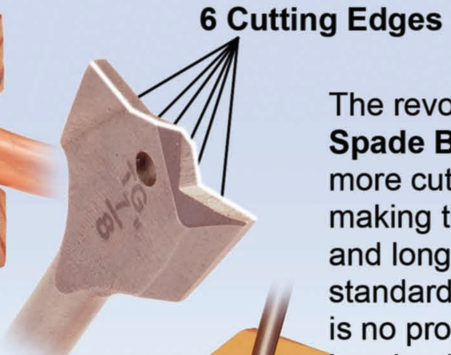

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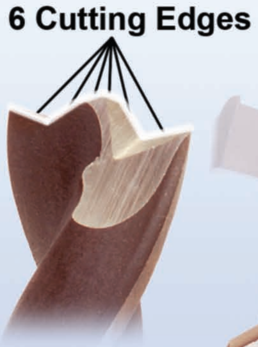

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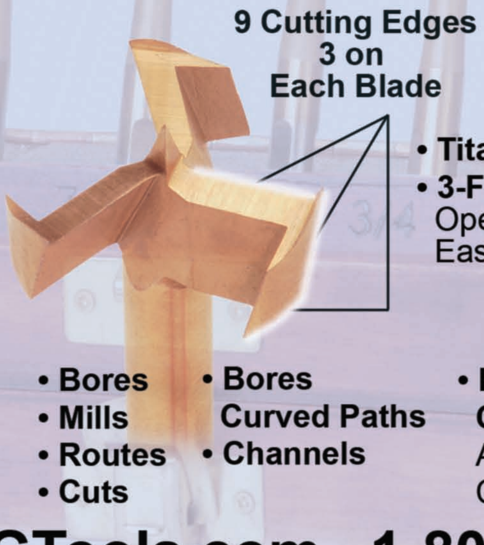

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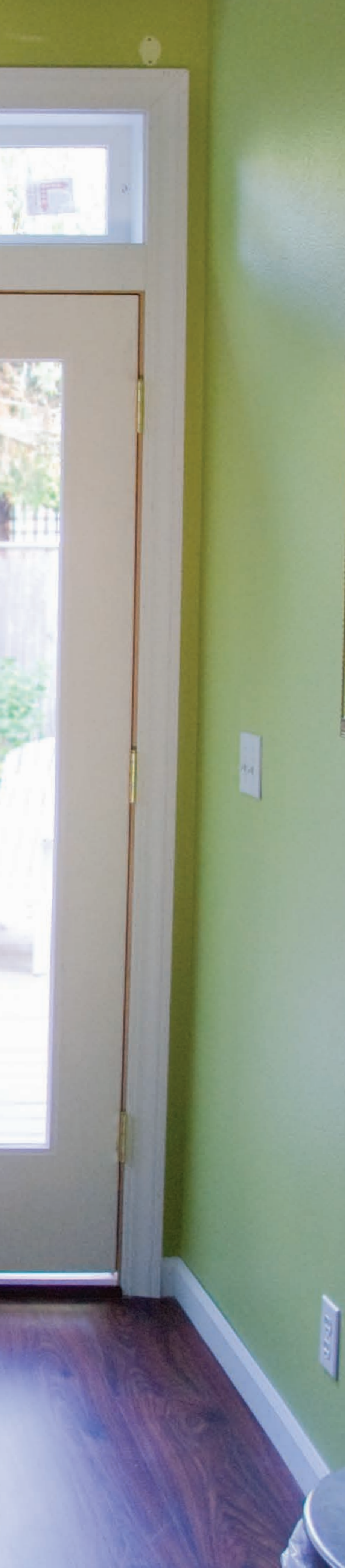

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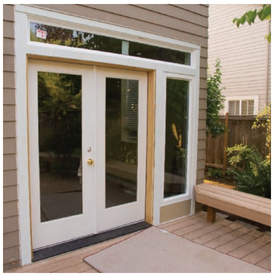


Build a custom door unit with transom and sidelite windows.

By Larry Walton

When Chris Williford first talked to me about her patio doors, her primary concern was that the large, sliding glass door was hard to operate. It's really not much wonder that the overgrown vinyl window was a brute to open or close. For starters, it was an 8-by-8-foot unit, which means the active half was two 4-by-8 sheets of tempered glass … In other words, heavy.

Sliding glass doors are often made by window manufacturers who apply the same design features to their patio doors that they use on their windows, and there are some advantages including price and weather-tightness.

The disadvantages, however, are functions of size and weight. While the vinyl frames can be made a little sturdier than those used in most windows, it usually doesn't make up for flex in the door edges or the sheer weight, which contributes to difficult operation.

Home improvement solutions often require a fresh look. In this case, we asked the question, "What do you have if you take out the slider?" Answer: An 8-by-8-foot rough opening. Now the question becomes, "With what can we fill that hole? Does it have to be a slider? Can we put in double doors or a single swinging door? What can we use to cover the surrounding area?"

A set of French doors was Chris' first thought. But a pair of 8-by-8-foot French doors alone would be large, expensive and out of place. So we started sketching possible combinations of doors and windows. We considered a smaller slider, which would address both the weight and weather-resistance issues. But Chris had her heart set on swinging French doors.

After a few combinations, we came up with a pair of 5-by-6-foot-8-inch French doors with a sidelite window along the inactive side, and a transom along the top. This maintained the large window areas the Willifords were used to, it provided the desired French doors, and it allowed for a screened window opening for cross ventilation in the room.

The cool thing about a window/door combination like this is that you can combine a number of elements, often using off-the-shelf components, and build a very attractive wall section or doors and windows that when trimmed look like a single unit.

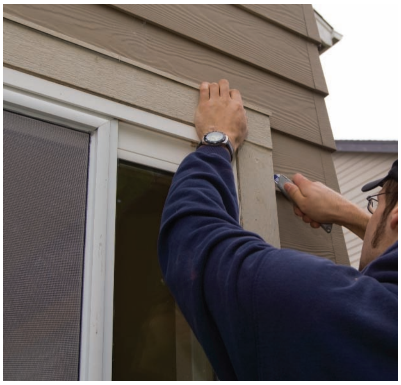
The same concept can be applied to a single entry door with a sidelite window or a living room wall with windows that can be grouped together and trimmed as a unit.

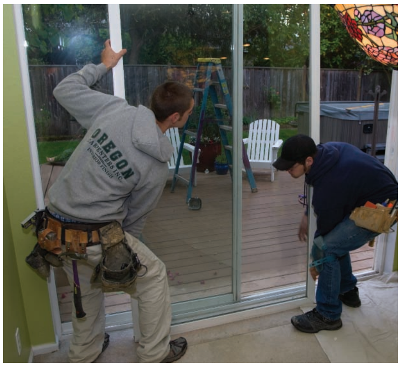
Here's how we replaced an unwieldy vinyl patio door with a French door, transom and sidelite combination.

STEP-BY-STEP:

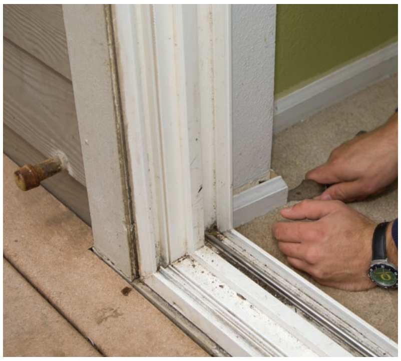
We started by cutting the caulking around the exterior trim with a utility knife. This project required no changes to the lap siding, so we did not want to damage it. Failure to cut the caulking will damage the siding when the trim is removed.

Next, remove the screen door.





We removed the active side of the door by lifting and swinging the bottom out of the track and moving it away from the project.



We then removed the base board that returned into the patio door frame.

CHANGING ROUGH OPENING SIZE

Changing the size of a rough opening is possible, of course, but it's really the subject of a future article. Making a smaller opening requires filling in the area not taken up with a window or door. The challenge here is matching the existing wall surfaces, both interior and exterior.

Making a rough opening larger is also possible, but the obstacles are different. To expand the width you'll need to address the header that spans the opening and carries the load above it.

Making the opening larger can also involve wiring and plumbing. So before you get out the reciprocating saw, you better have a plan for load bearing and utility routing.

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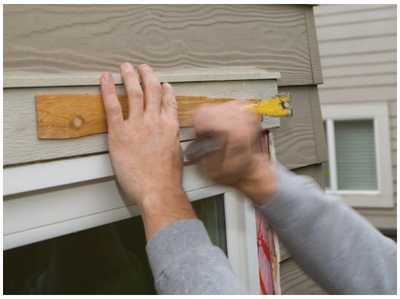
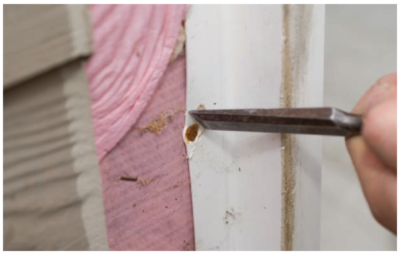
Carefully remove the exterior trim.

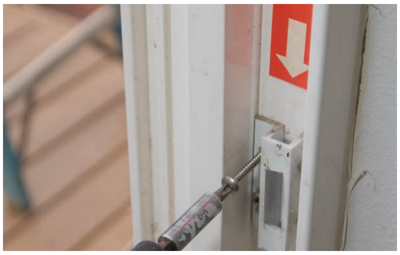
You may need to cut some more caulking in the process to avoid damage to the siding.



Use a scrap of wood, such as this cedar shim, to protect materials from crow bars and hammers when prying.



Using a chisel to cut the vinyl flange around nail heads can be a good way to release the flange.



Don't forget to remove the latch mechanism from the door frame. Properly installed, the long screws go through to the framing, which means they must be removed to release the frame.

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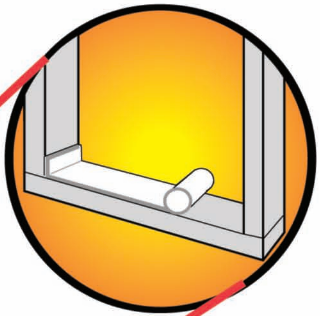

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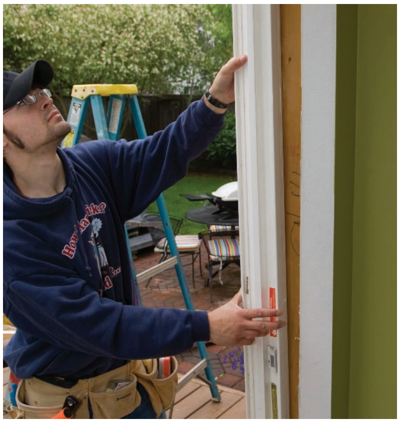

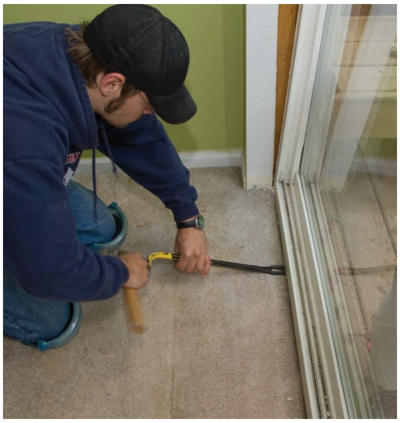

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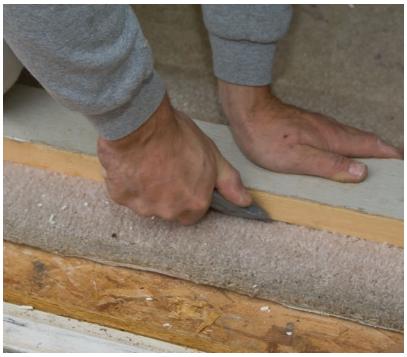
101
102

With the interior and exterior trim removed and the flanges free of nails, pull the frame out at the top.

If it was caulked when installed, then you may need to drive a bar under the bottom of the frame and do a little prying to loosen the frame.

Not until you get the frame out can you see what the true opening size is. We measured the rough opening and checked it against the combined door and window components we had on site.



We used a straight-edge and utility knife to cut the carpet.

This patio door had a drywall surround. Hitting the metal corner bead with a hammer removes

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joint compound and raises the edges of the metal for removal.

A bar under the corner bead allows you to pry it away. Be careful of the sharp edges on the metal.

We use a shortened handsaw to trim the extra drywall from around the opening.

Mark the location of the cross framing member first.

We put a couple of nails just below the layout lines to give the horizontal board something to rest on while it was being nailed into place.

Next, toe-nail the board into place.

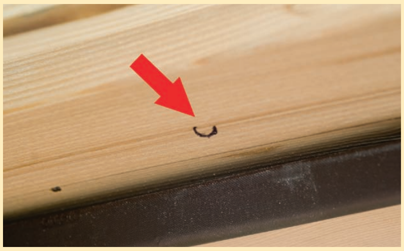
We moved the door jamb into place and used a screw through the hinge plate to hold it in position.

Before hanging the doors, we put the transom in place. The key here is to see how the trim boards will line up on both the interior and exterior.

A nail just above the flange kept the window from tipping out while we checked out the alignment with the doors.

SPOT ON ASTRAGAL HOLES

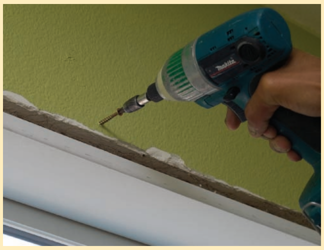
Double doors often have a bolt latch that secures the least used of the two doors. This allows one door to act as a door jamb, so the other can be used as a single swinging door. To secure the seldom-used door, latch bolts at the top and bottom are installed in the astragal, which is attached to the edge of the door. Sometimes the installer must drill a hole in the jamb header and the threshold to secure the door. We mark the location of this bolt latch by loading the end with a sharpie, closing the door to the proper location and extending the bolt until it touches the head jamb and leaves a mark where the hole should be drilled.

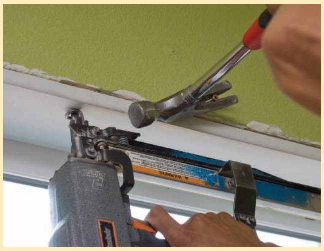


CLOSING THE SURROUND GAP

Getting the surround boards to fit up against the window frames can be a challenge. Drive a long screw through the drywall and into the framing near the spot you want to shim and nail the surround.

Use a claw hammer as though you were going to pull the screw like a nail, using the edge of the surround as the fulcrum point. Rather than pulling the screw, it will force the surround board against the window where you can nail through the board and through the shim into the framing.

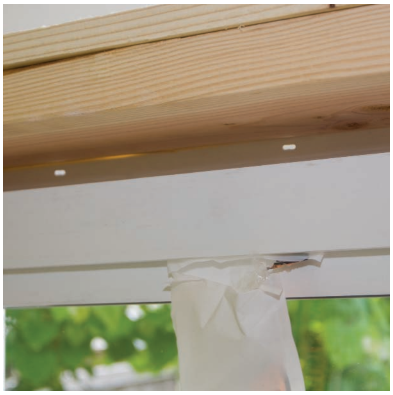




We found that we wanted to shift the transom window over, so we took the window back down and trimmed the sheeting back to make a little more room.

With the transom in place, we next tested the sidelite window for left to right position. Making sure this location lined up with the transom would be a key to having all of the trim boards work out properly.

We used a level to transfer reveal marks from the door jamb to get the right header height position for the sidelite window.



Note how the flange now has backing when the window is in position.

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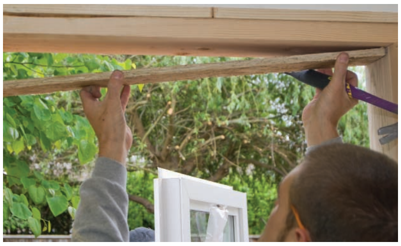
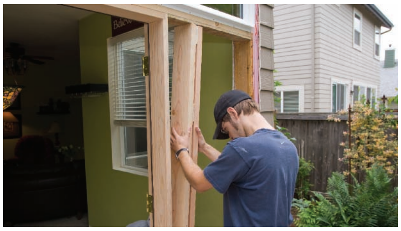
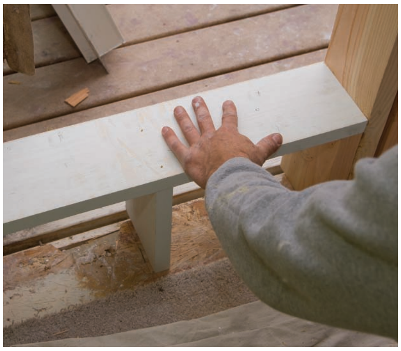


This required adding a piece of furring on the underside of the horizontal framing board to properly back the window flange.



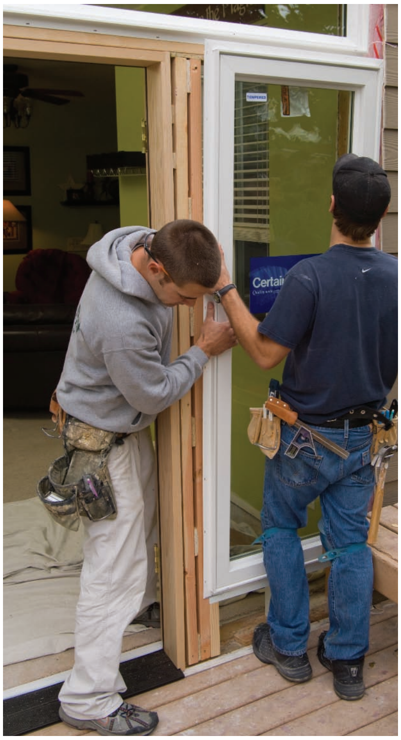
We added a vertical framing piece that extended from the floor to the horizontal frame.

Note that we doubled a 2-by-6 and added spacer boards.



Having established the elevation of the top sidelite window, we laid out the framing under the window and framed it in as well.

The side window went in so it lined up with the transom left to right and with the door jamb up and down.



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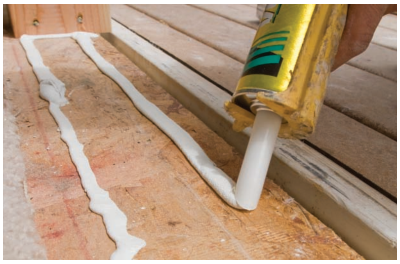
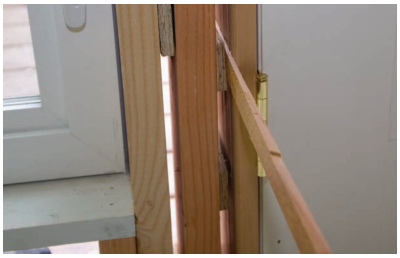
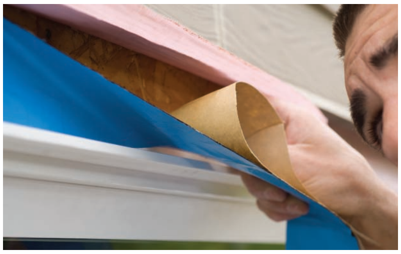


Remember, we had the doors temporarily in place to determine the window locations. We pulled the door jamb out and caulked under the threshold in preparation for hanging the doors.

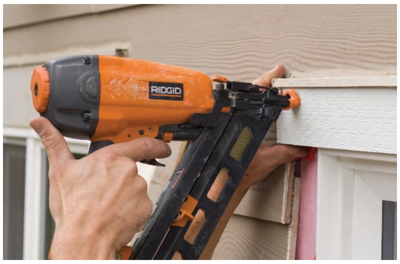
With the jamb in position but loose, we put the doors on the hinges.



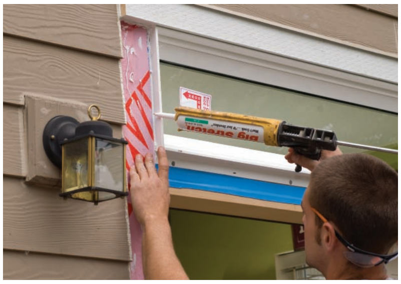
We hung the doors using cedar shingles as shims to make the minor adjustments to get them operating correctly.



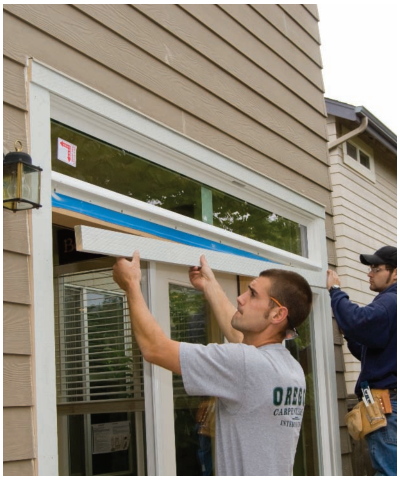
We sealed the window flanges and the door jamb to the exterior of the house with Blueskin Weather Barrier.



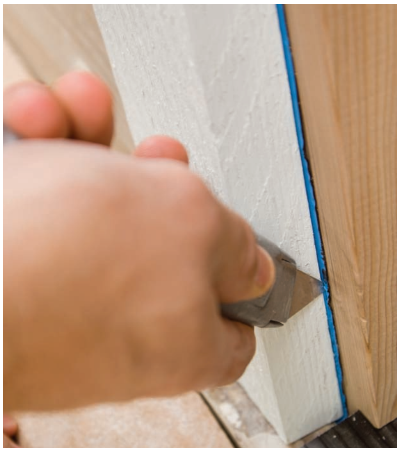
We left the flashing in tact above the opening and tucked the header trim board right up underneath.



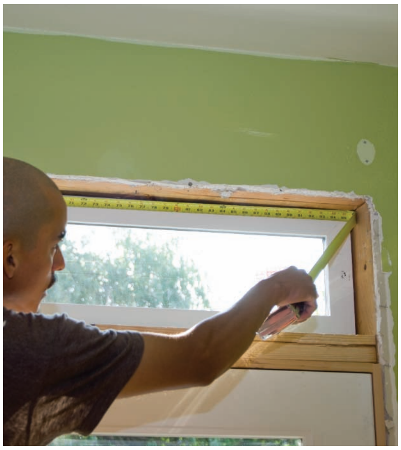
Caulk applied behind the trim boards seals where they meet the window, door jamb and siding.



We continued to fit the trim boards between the siding and window frames while watching the reveals to the door jamb. We put the top horizontal piece all the way across, supported by the outside verticals. Next came the horizontal board under the transom window, followed by the vertical mullion between the doors and sidelite.



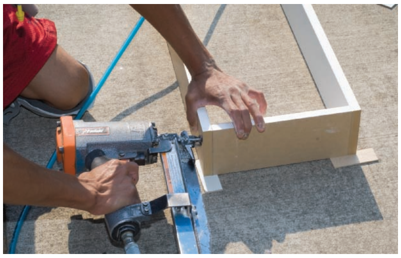
Blueskin that extended beyond the trim was cut off. The cross section of the weather barrier is easily covered by the bead of caulk that seals the trim to the door jamb.



The interior trim starts with measuring the windows for window surrounds. Surrounds are four-sided boxes that transition from the windows out to the wall surface.

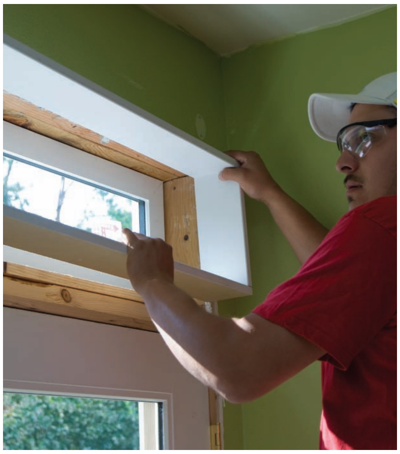
STOCK PARTS, CUSTOM DOOR

We cut all of the parts for the surrounds before nailing them together.

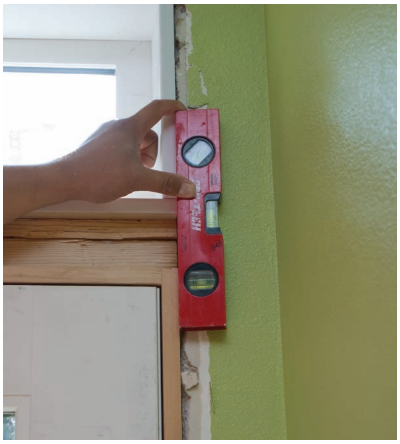


We always make our surrounds so the horizontal boards pass by the vertical boards.

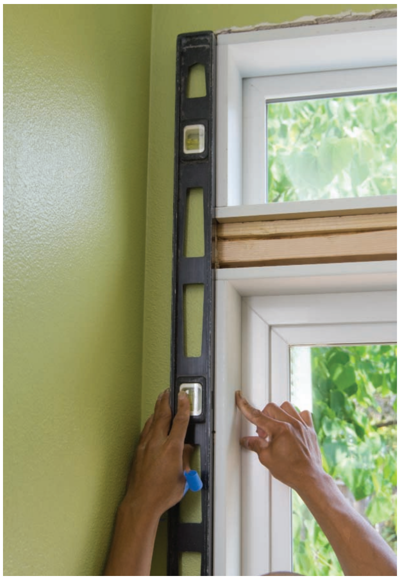
The surrounds were nailed together in the driveway and brought into the house in one piece.



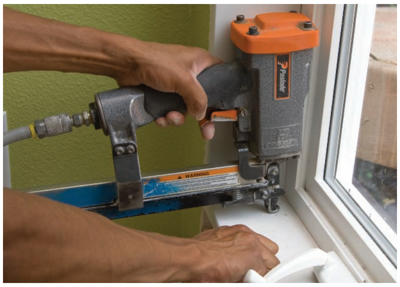
We moved the surrounds into the window openings and left them loose so we could adjust them for alignment.



We made the left to right alignment of the transom by matching it to the door jamb.



We then lined up the sidelite window with the other side of the transom window.

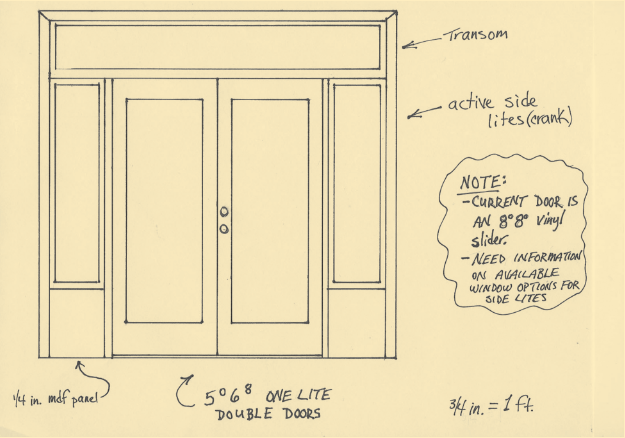


Each window surround was anchored by first shimming and nailing near the corners and then using a straight edge to align the boards from corner to corner.

ROUGH DRAFT

One of the early sketches I made proposed sidelite windows on both sides. In the end the homeowners opted to shift the doors to one side for traffic flow, which provided a larger window as the one sidelite.

A simple drawing like this helps everyone visualize the finished product and can be used to get bids on the doors, windows and trim needed to complete the project.


Transom
active side lites (crank)
NOTE:
- CURRENT DOOR IS AN 8°8° vinyl slider.
- NEED INFORMATION ON AVAILABLE WINDOW OPTIONS FOR SIDE LITES
1/4 in. mdf panel
5°6⁸ ONE LITE DOUBLE DOORS
3/4 in. = 1 ft.

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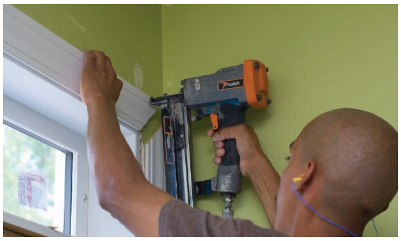
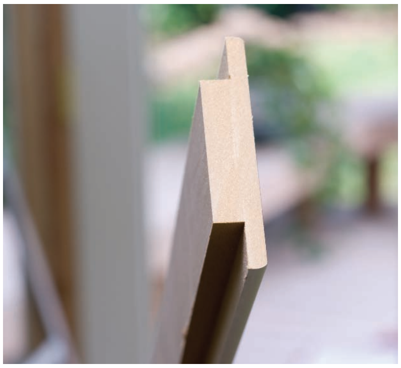
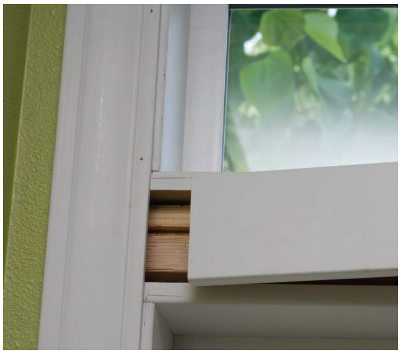


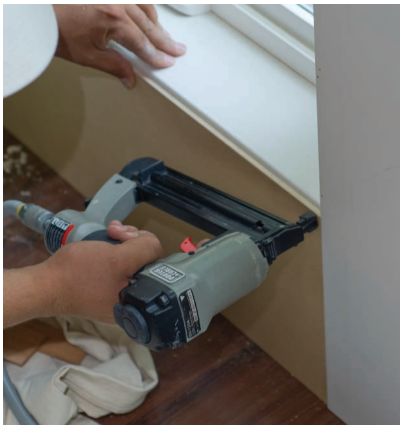
With the two window surrounds in place, we installed the header casing and the two outside pieces of casing.



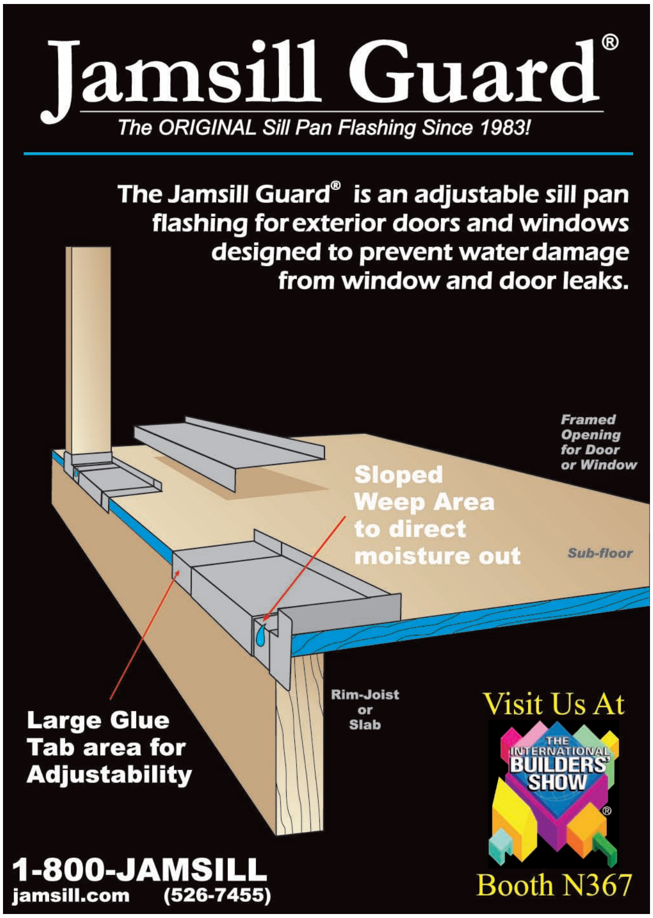
Next came the horizontal mullion piece under the transom window. To get the right reveal thickness to match the casing, we cut rabbets along the vertical edges.



We then fit the newly-milled horizontal mullion between the vertical casings.



Lastly, we installed a vertical mullion to bridge between the sidelite and door jamb and then filled in the area below the sidelite window with a MDF panel. **EHT**



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Add comfort and beauty to your deck with lighting, fans and electrical outlets.

EXTREME DECK CO

By Monte Burch

A deck is one of the popular features on the homeowner project list. Adding lighting to your deck not only creates ambience, but adds to the décor and its usefulness. Deck lighting also provides more safety and security to your home. Installing electrical outlets adds to the ease of use of the deck. If the deck is covered with a canopy or sunroof, adding an outdoor fan increases comfort during the hot months. The deck and cover shown added all three, and installation is a fairly easy, do-it-yourself job. The lights shown are both low-voltage 12-volt and solar powered.

MFORT

SEE THE LIGHT

A wide variety of deck lights are available, including insert lights for steps, railing lights, post top lights, overhead deck lights and ground-based stake lights that can be used next to a low deck. Step lights make it much safer to negotiate steps at night, while railing lights can add to nighttime usefulness and visibility. Simple deck lights can be placed just about anywhere to add a downward light where needed. On the deck shown, the down lights are added to the sunroof posts on the underside of the sunroof. Post-top lights can also add to the ambience.

The most common deck lighting is the low-voltage type that utilizes a transformer to convert a 120-volt electrical supply into 12 volts, which is safe for exterior conditions. The transformers feature either a timer or a photocell to turn on the lights when night falls, and turn them off when daylight comes. The photocell is the easiest to use. The timer must be adjusted as the seasons and daylight times change. Photocell timers are, however, more expensive. Low-voltage lights may feature LED or incandescent bulbs.

“We’ve found the incandescent bulbs to be more popular,” says John Davis, owner of Highpoint Deck Lighting. Highpoint not only sells, but also installs deck lighting. “In fact, we had to completely remove all the LED lights we had installed on a huge new deck, and replace them with incandescent bulbs,” adds Davis. “The LED lights are bluer and lack the golden glow of incandescent bulbs.”

Deck lights may be constructed of plastic or metal. However, high-quality products, such as

Recessed step lighting, such as that from Highpoint can be used to provide lighting for steps and stairs

Railing lights can also provide more light for railings over steps or as a décor for the deck.

Hanging lights, such as these from Highpoint, add to the ambience and are an excellent choice for deck canopies.

Solar lights, such as these post lights from Malibu, can provide illumination without the need for electricity.

Solar lights can also be set on a table for party illumination.

Malibu deck lights placed on the upper framework of the sunroof provides a soft down light on the deck below.

Ground-stake held lights, such as these from Malibu, can be used around low decks.

A hanging lantern light can be fastened to a deck with a block of wood with a groove cut in it the diameter of the fixture tube.

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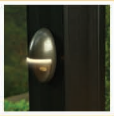
Accent Light
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Riser Light
Gives off a soft light on steps and stairs for effect and safety.

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those from Highpoint Deck Lighting, are made of thick gauge, non-rusting, corrosion-resistant, solid brass, copper, stainless steel or powder-coated aluminum. They are then finished with a premium earthscape acid-washed treatment or a durable powder-coated finish and have a limited lifetime warranty.

Highpoint offers several styles, each with a soft-warm glass and subtle decorative overlays. The fixtures create just the right amount of gentle light to safely and comfortably illuminate your deck. They are engineered with slide-on face plates for easier, quicker installation and tool-free access to the light bulb, making maintenance quick and easy. When shopping for deck lights, the better quality lights from manufacturers like Highpoint and Malibu use real glass for their diffusers rather than plastic. Plastic deteriorates over time from the heat of the bulb.

PLUGGING IN

The first step is to make a rough sketch of your deck and determine the types and locations of desired lights. The fixtures should run in sequence with the total wattage of the run not exceeding the transformer's circuit capabilities. Total wattage is determined by multiplying the number of lights by the wattage of the bulbs. Do not exceed the transformer's allowable circuit wattage.

Also, determine the location of the transformer. Timer transformers can be installed almost anywhere, but close to the first

First step is to locate and install the transformer.

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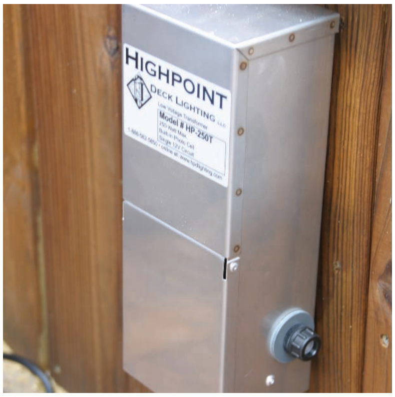
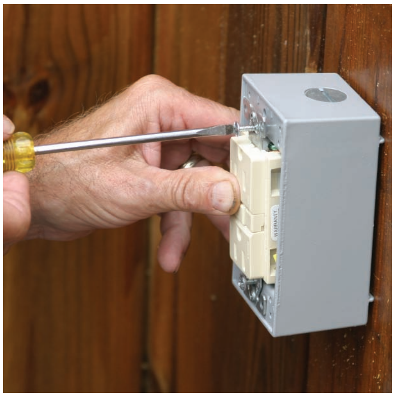
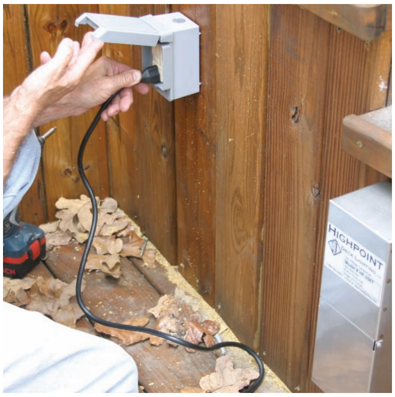


If the transformer is a photocell design, make sure the transformer is installed where daylight can reach the photocell.

Some transformers are timer activated.

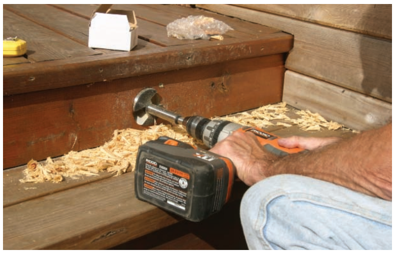


In some cases you may have to install a weatherproof outlet box and GFCI outlet.



The transformer must be installed near and plugged into a GFCI outlet in a weatherproof box.

Recessed step lights are installed in holes bored in the step risers. Bore the holes using a 3” hole saw or forstner bit.



light is best. Photocell transformers must be installed with exposure to direct sunlight. Transformers must also be located with access to a 120-volt outlet. The outlet must be GFCI protected, and in an outdoor, weatherproof outlet box or cover. The power pack or transformer must be located at least one foot off the ground and at least 10 feet from any pool or spa. If you need to install an outlet, this is also a good time to install additional outlets for use with grill rotisseries and as an electrical supply for other outdoor uses.

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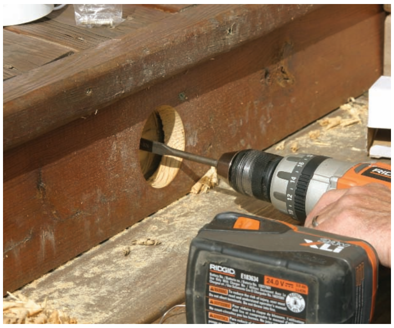
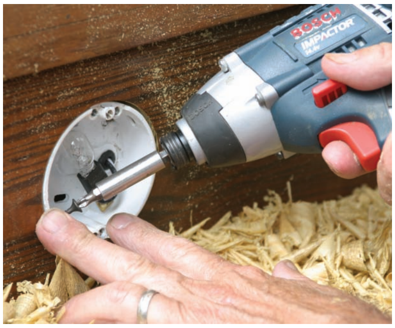
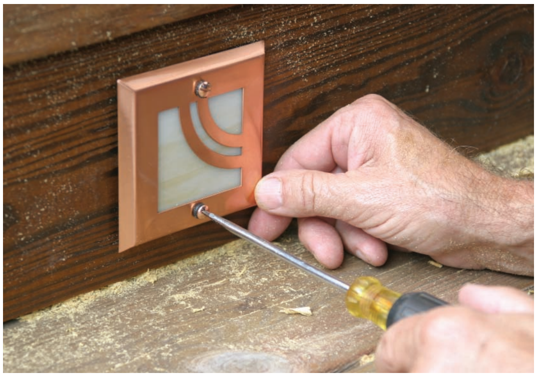
Using the installation instructions provided by the manufacturer, install the transformer. Then install the secondary or low-voltage wire as per the instructions. The secondary wire must be UV resistant and UL listed 12-2 or thicker low-voltage wire. Do not exceed 100 foot per run or 250 watts per run/circuit. Use 10-2 or 8-2 wire for runs exceeding 100 feet or for those with over 250 watts. Make sure the main secondary wire is long enough to reach the first fixture. Never bury wire more than 6 inches below grade or install a transformer or light fixture within 10 feet of any source of water. Make sure all secondary wires are secured in place with insulated cable tacks.



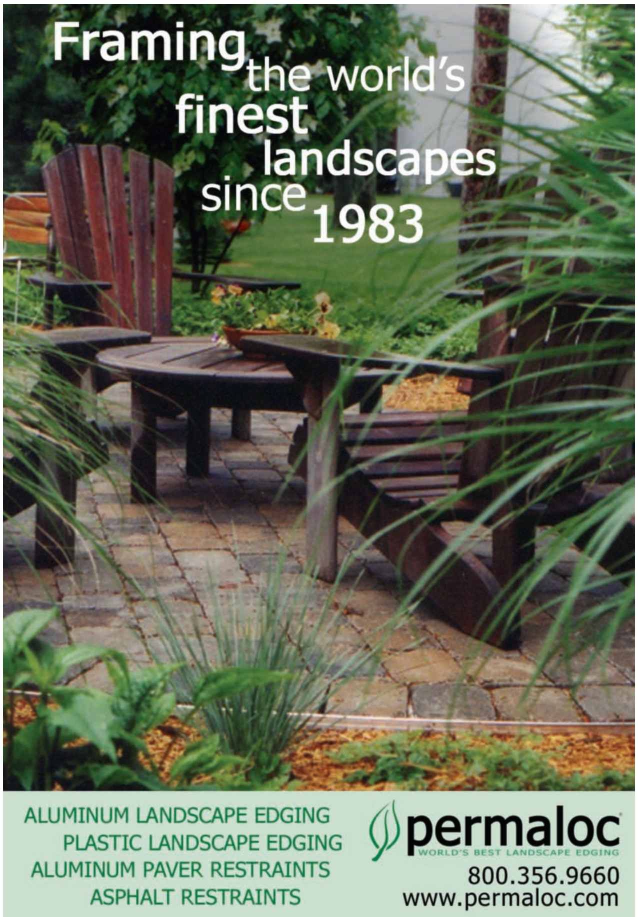
If going through a double header, bore the large hole then a small hole in the inside header.



Install the light in the hole, run the secondary wire along the back of the risers, and attach the fixture wires to the secondary wires.



Then install the cover.



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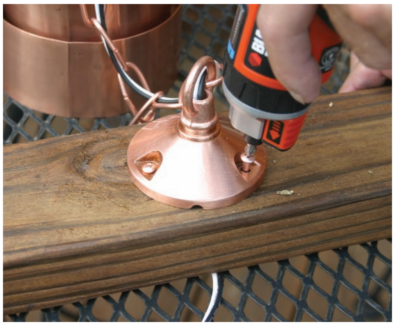
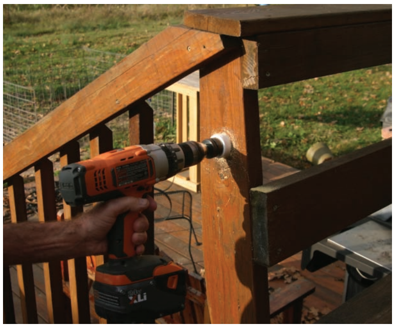
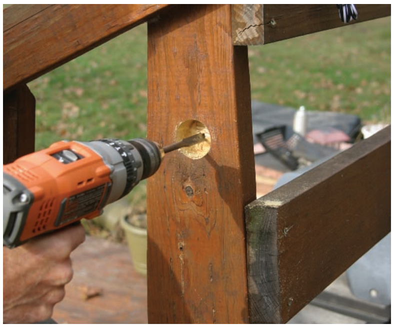


A hanging light for a deck canopy is fastened to a support block, with wires run through the block.

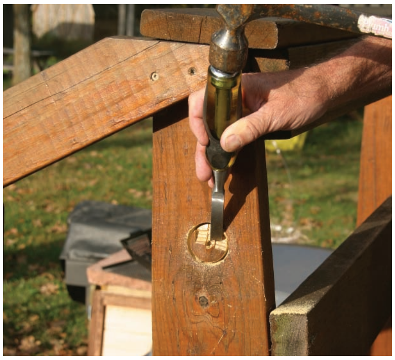


Make a 1-1/4" hole 1-1/2" deep in the post, or 1" deep in the railing to receive the fixture.

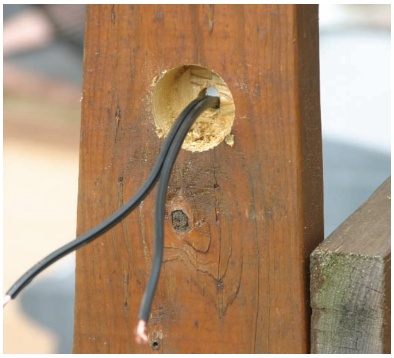


Bore a 1/2" hole through the remainder of the post or railing.

The block is then fastened to the sunroof framing and the fixture wires are attached to the secondary wires.



Chisel the waste material out of the hole.



Feed secondary wire through the back into the hole.

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The different types of fixtures require different mounting and installation methods. Make sure you follow the manufacturer's instructions for each type. With the fixtures installed, run the secondary wire and attach the fixtures to the secondary wire. Some fixtures utilize a clamp-on connection; others require

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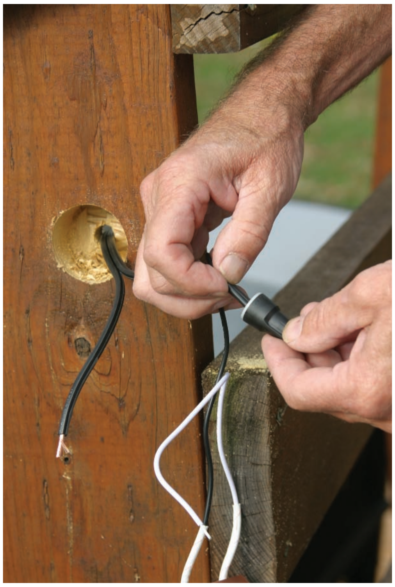
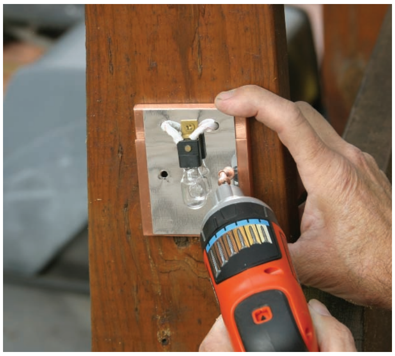
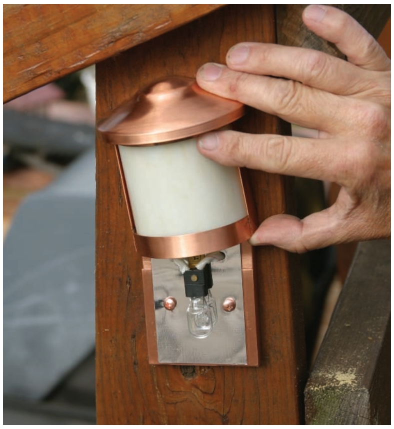


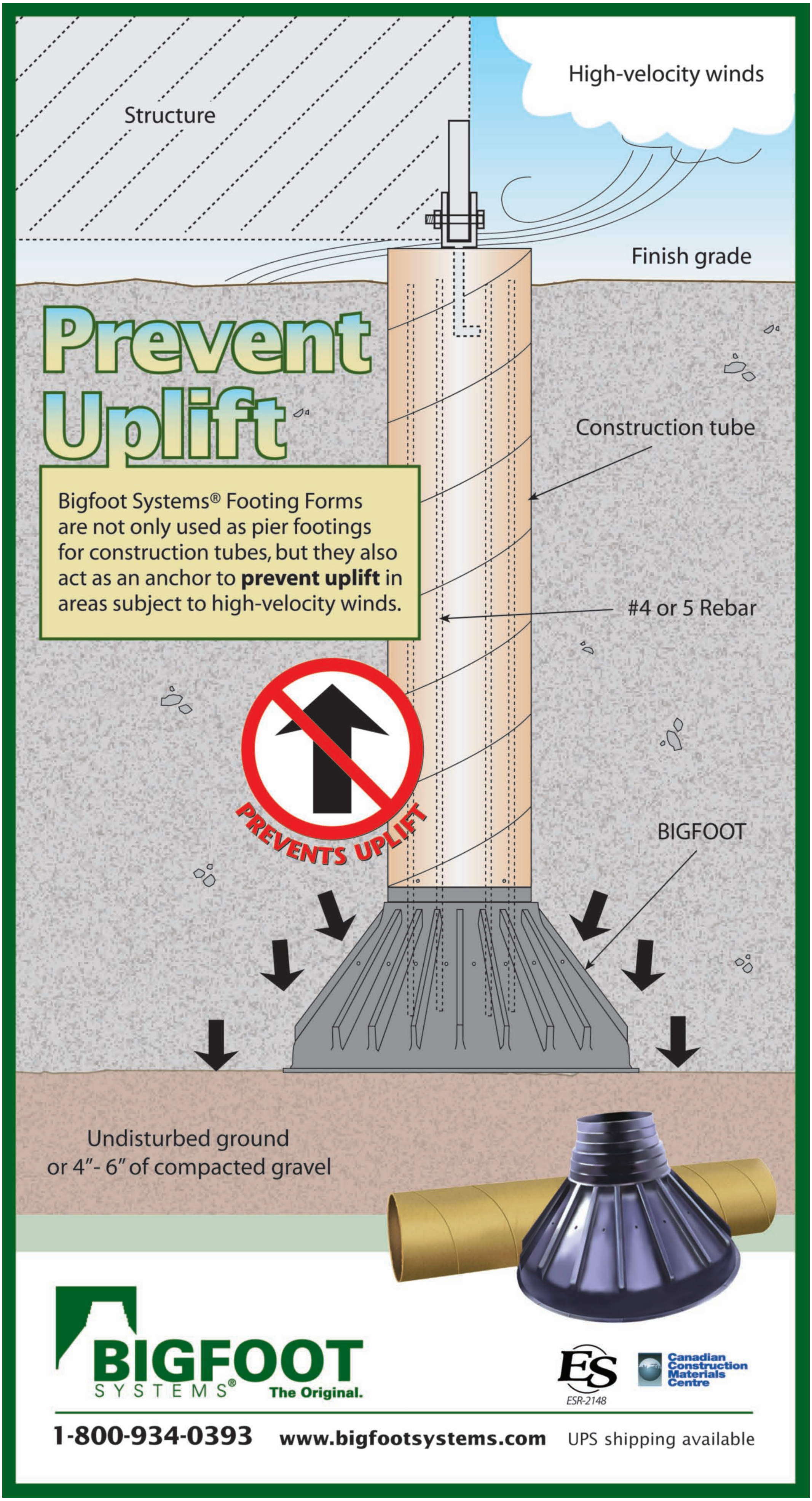
Strip the fixture wires, as well as the secondary wires and attach the wires with wire nuts. Make sure the wire nuts are tight and no bare wiring is exposed.



Tuck the wiring into the hole and install the back plate.



Then slide on the front cover plate.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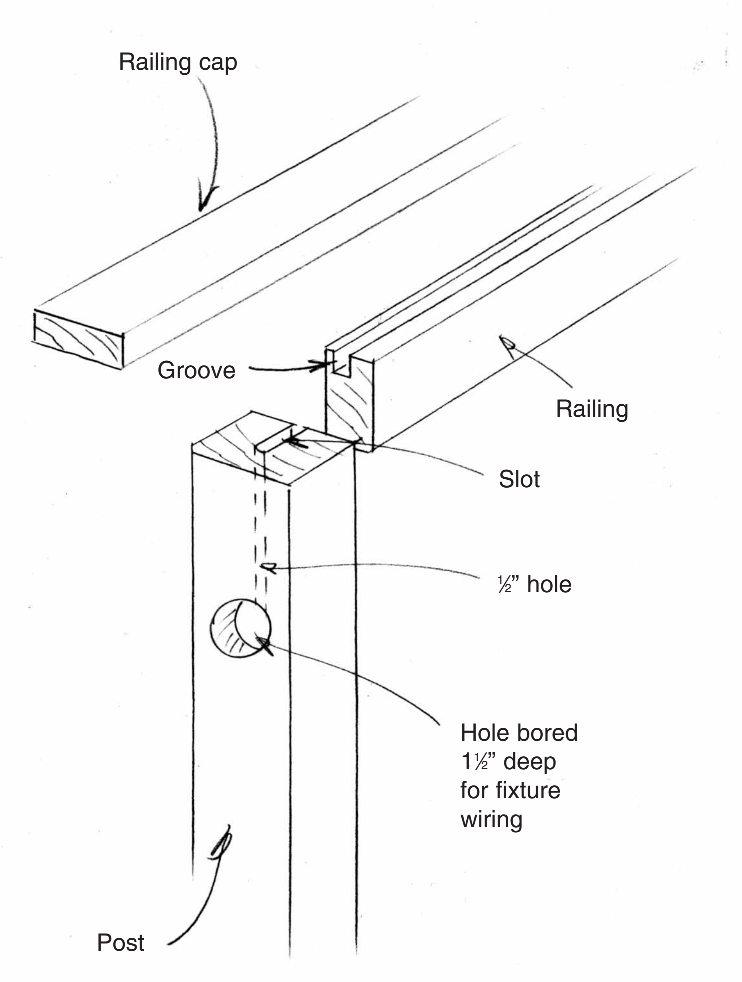
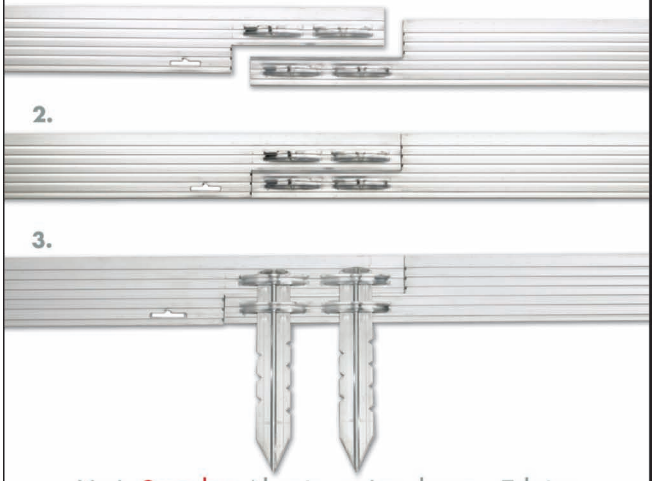
special silicone wire-nuts made for connecting fixture and secondary wires in exposed areas.

Once you have installed and connected all fixtures, attach the secondary wire to the transformer, plug in the transformer to the outlet and turn on the circuit. If using a timer activated transformer, set the timer according to the manufacturer's instructions. When evening falls, make plans to enjoy your deck in a totally new way. EHT



Wiring can be concealed in a number of ways.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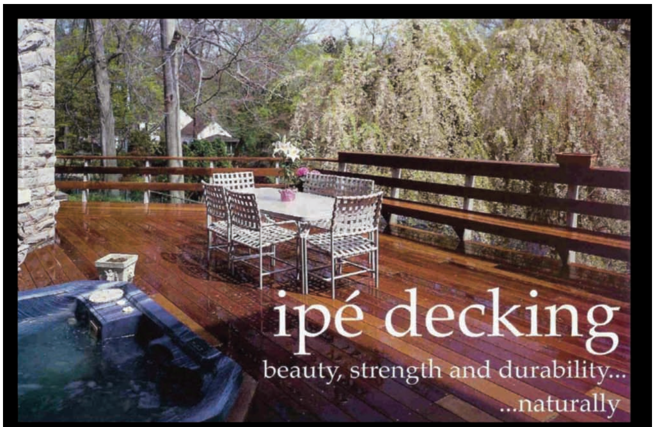

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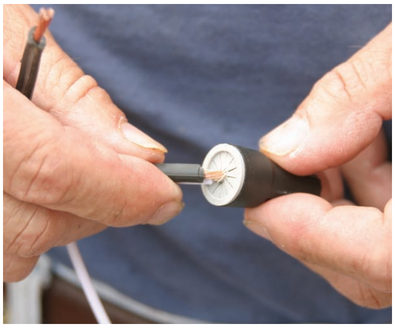
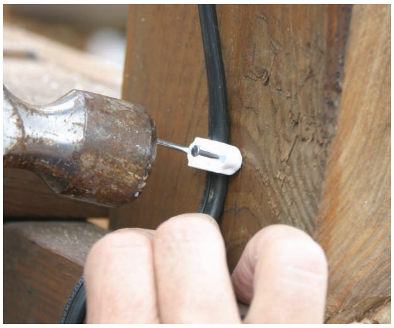
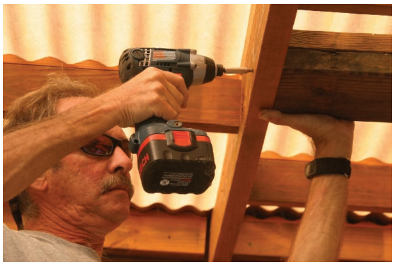


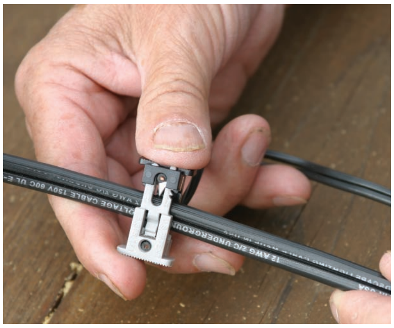
For any exposed connections, use only silicone-filled wire nuts.



All low-voltage wires must be properly anchored in place.

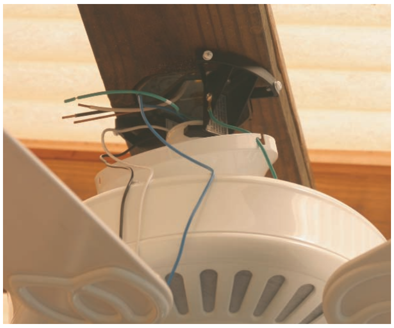


A light fixture box is attached to a support piece. The support piece is then attached to the underside of the canopy or sunroof framing.



Some low-voltage lighting connections are made with snap-on connectors, fitting over the secondary wires.

An outdoor ceiling fan can make a deck canopy or sunroof much more comfortable in the hot summer months.



An electrical wire is run from a switch to the fixture box, and the fan assembled, attached and wired in place.

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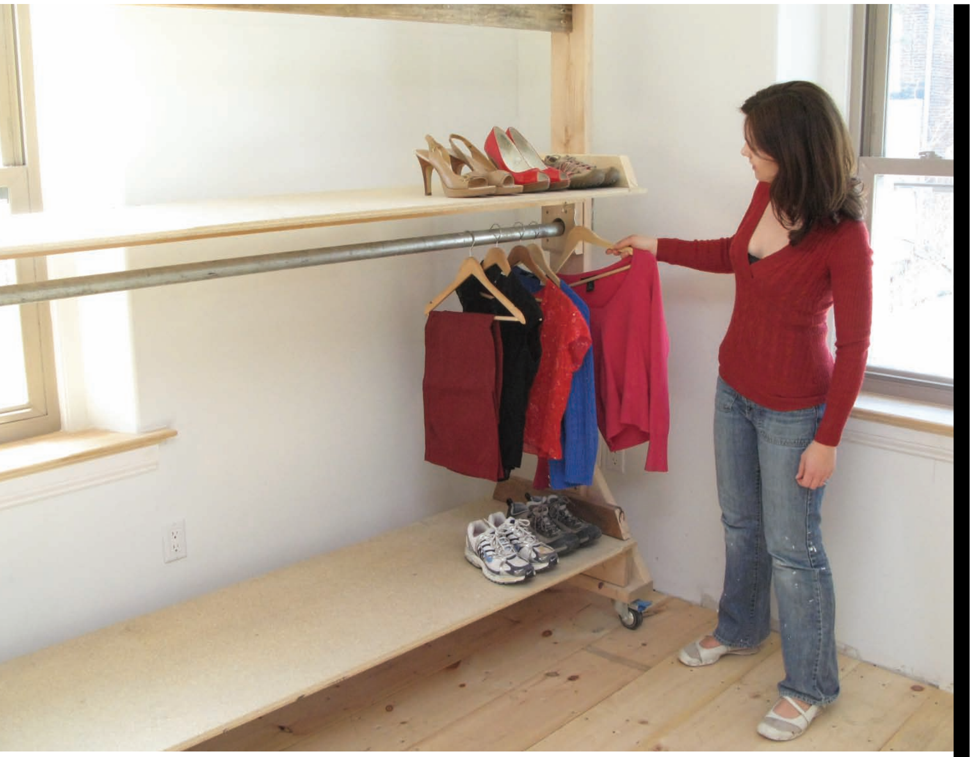
Need to store stuff for a while, maybe longer? Here's a quicky-tricky rolling rack that'll hold everything—and then some.



By Matt Weber

So here's an ironic situation: As part of a master bedroom upgrade, one of my tasks was to increase its closet storage—from near-zero to total-hero. To do that, however, I needed … storage.

I mean, really. There's already no storage but to complete the project I need more storage—while I build the *new* storage…ARRGGH!

A big part of the challenge is that the home being remodeled is occupied and being upgraded one bedroom at a time. While each room is renovated, the home's occupants hopscotch between finished and unfinished bedrooms, leaving me nowhere to hide anything out of the way while I build.

The solution was to hide the things that needed storing in plain sight—and to make the hiding place mobile.

To that end, I designed and built a big, beefy rolling storage center to temporarily house the clothes, shoes, hats, ties and whatever else, so the multi-week project could get underway.

The result was an inexpensive, rock-solid solution that enabled the homeowners to access their things—from both sides of the rack if need be—and access lesser-used items stored on the "back side" of the rack, like plugs, a vacuum cleaner, out-of-season clothes, etc. It also became clear while I was building the rack that a bedroom build-out isn't the only place a system like this would work. It's also ideal in a garage setting for storing all manner of items from hockey bags to gardening supplies to kids' toys. And because it rolls, seasonal items that are used less frequently can be stored behind it without being trapped.

MATERIALS & TOOLS

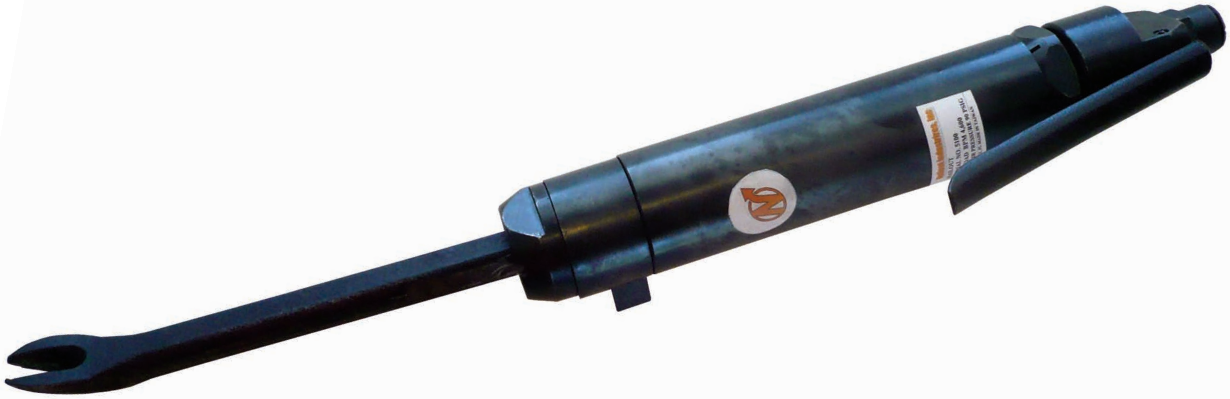
This customized rack is a simple structure made from 2-by-6s and 3/4-inch sheet stock. It rolls on 2-1/2-inch swiveling, locking casters, and the entire thing is held together with 2-1/2-inch deck screws and 1-5/8-inch drywall screws.

I cut all the pieces on my slide compound miter saw, although they could also be sized using a circular saw. I fastened everything using my cordless impact driver. I used my Starrett ProSite protractor to map the one funky angle in the whole thing. I cut the steel conduit closet pole with a recip saw and metal cutting blade.

LAYOUT & DESIGN

The basic design is this: Two uprights (they look like an upside-down Y) on each end form the vertical structure. The uprights are bridged by cleats and 2-by-6s (stretchers) on edge. The cleats and stretchers also form the shelf supports, which are then topped by sheet stock. I also ran a 2-inch electrical conduit to accept hangers.

NailOut



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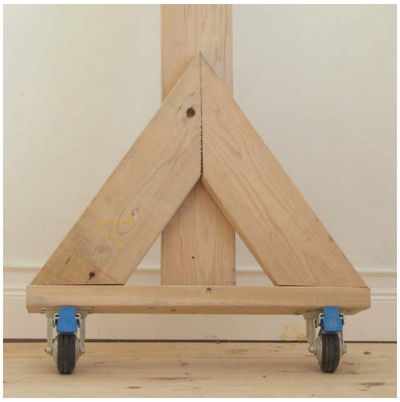
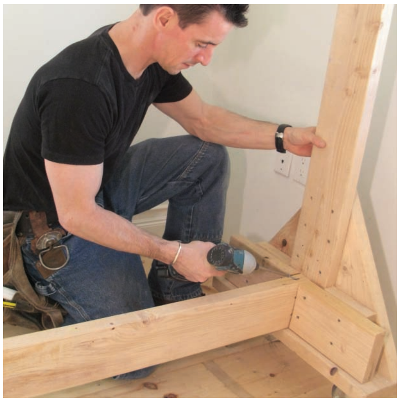
While the project is scaleable (i.e., you can make it longer, shorter, smaller than the one shown here), I needed this one to roll between rooms inside the house. That means the door openings governed height and width. And so I didn't have to cut every board to a custom size, I made it 8 feet long and could still roll it around. This also had the added benefit of creating enough lineal space for the things that needed to be stored—and every inch of it was used!

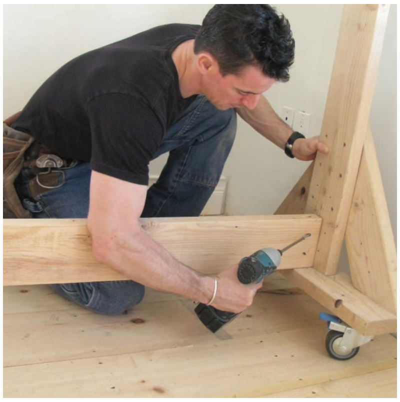
The finished dimensions of this rack were 8 feet long, 28 inches wide and 77 inches high. It was also four-tiered—a lower shoe shelf, a closet pole at 48 inches, a mid-shelf shelf at 51 inches, and a top shelf at 76-3/4 inches. Safety Note: I felt the height-to-width ratio was about maxed out here. In other words, we got maximum stability and maximum height. I would not build one much taller than 77 inches without adding commensurate width.



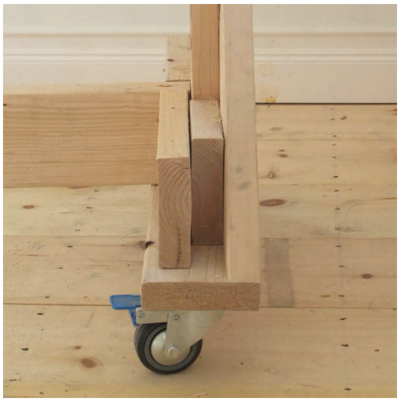
Anatomy of an upright assembly: casters (locked), base, angle braces, upright.



Pack out the angle braces with 6" blocks, then laminate with 2x6 shelf support blocks.



With the top of the upright held securely, predrill and toe-screw a 2x6 stretcher to the center of the upright assembly.



Anatomy of a completed leg assembly with stretcher.

CONSTRUCTION

I love stuff that I can blast together; the instant gratification of going from plan to complete project is fun. This is one of those. You can make it dovetail-detailed if you want (say, if you were planning to have it for a long time or wanted to practice your woodworking skills), but I needed more function than form so I got some straight 2-by-6s and 2-by-4s and went to town.

Leg Assembly. Each leg (and upside-down Y structure) is comprised of a base, two angle braces, the upright and two casters.

Begin by cutting the base to length—28 inches in this case. Then cut each angle brace to a total length of 28 inches. On one end, cut a 30-degree angle; on the other cut a 60-degree angle (see "Mapping Angles" sidebar).

On a flat surface like a workbench, pilot and countersink a hole then connect the angles with a screw from one side, forming a triangle without a bottom.

CLOSET POLE SLEEVES

For the closet pole sleeves, cut a 2-by-6 12 inches long. Then, 3 inches down from each end, mark the center of the board.

Use a hole saw or 2-1/2-inch plumber's bit (or whatever bit you have that is larger than your closet pole diameter) and drill out the holes.

Cut the piece in half, forming two sleeves. Install one sleeve on an upright and fasten using one screw through each corner of the sleeve.

Note: Conduit usually comes in 10-foot lengths. I trimmed mine to size—just a hair under 8 feet—using a recip saw and metal cutting blade, no fuss, no muss.

Slide a sleeve over the other end of the pipe. Insert the pipe into the sleeve already installed.

Raise the pipe and second sleeve. Be careful not to let it fall out of the first sleeve. Fasten on the layout mark.

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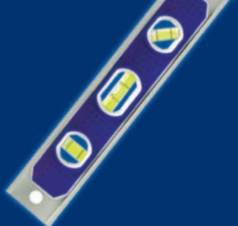
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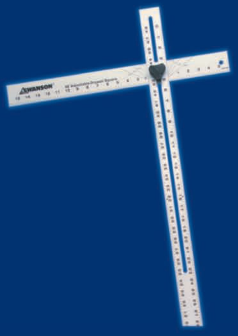
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Hold the 2-by-6 base perpendicular to the triangle and fasten the base to the braces. (If you looked at it from the side, it'd look like an "L" with the long side laying flat on the bench). Screw from the underside using three screws for each angle brace.

With the base assembly in the same orientation (although you may have to move it from a table top to the floor), fasten the upright to the base. Make certain it's centered on the assembly. I do this by marking the center of the base, then the center of the upright. Once the lines line up, I know I'm on the mark. And since you're fastening the upright inside the base assembly—this raises it 1-1/2 inches from a flat surface—it helps to tuck a block under the unsupported end of the leg to keep everything on an even plane.

Install the casters—and lock them! This trick will help keep the wheels from rolling later when you might not expect it.

Frame Assembly. This is where you run the 2-by-6 stretcher from one leg assembly to another, turning the individual parts into a unified whole.

It can be done working alone, but having a helper for just a few minutes is easier. If you're working alone, screw the upright to a wall so it stays put. Prop up the 2-by-6 stretcher on a block. Predrill, countersink and toe-screw the end of the board into the center of the upright. Repeat for the other side.

If you have a helper, have them hold the upright vertical while you

Install sheet stock. To save some money, I used 3/4" underlayment. It's smooth and easy on clothes. It also costs a lot less than plywood.

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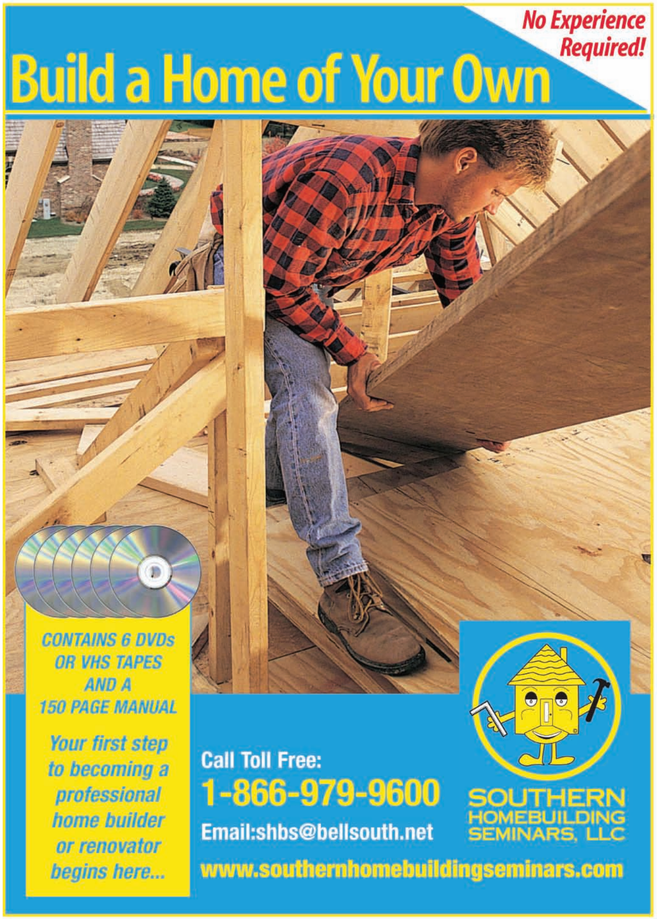

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Fasten closet pole sleeves to the inside face of the upright using four screws.

MAPPING ANGLES

There are only two angles to map out on this project. And if you're building the rolling rack as it's shown here, 30 degrees on one end and 60 on the other adds up to 90 and gets halfway to a right triangle. If you want to tweak your own angles or simply double check your work, here's a no-number way to do it:

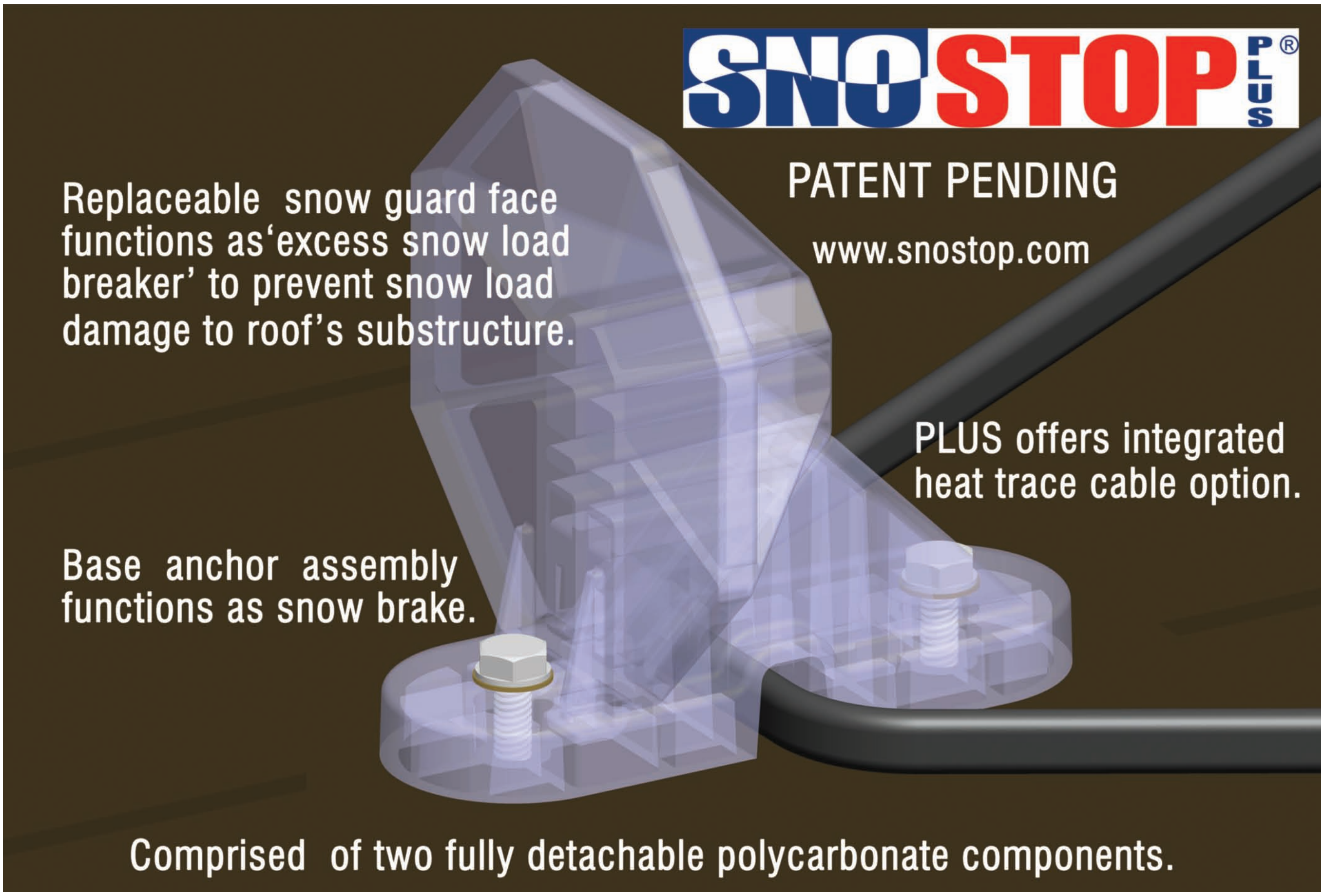
Use a framing square and strike a straight line. I registered mine off the edge of my workbench.

Mark the center of the base. Cut a 30-degree angle on one end of a 2-by-6 and leave it about 40 inches long.

Align the center line of the base and the square line on your bench. Place the 30-degree cut on the base, flush to the end.

Register the framing square off the edge of the base and mark the projection on the wild, or long, end of the angle brace. Cut.

Note on cutting: 2-by is far from furniture-grade stock, and if you're making cuts with a circ saw, don't expect angles to be perfect. They should be good, but not perfect, unless you're dressing very dependable stock and making angle cuts with your cabinet table saw.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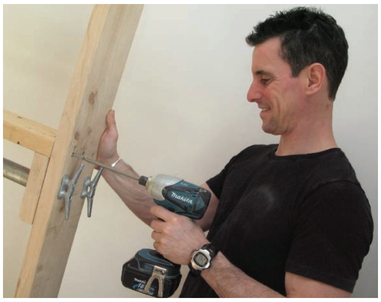
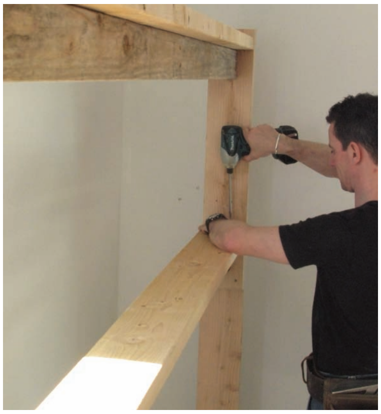
work. It's much easier, and you don't have to predrill and run toe-screws through the end of the stretcher, because you can face-screw through the outside of the upright. With the bottom stretcher securely fastened, the unit will stay put and you can start putting the rest of the parts in without worrying a piece will tip over.

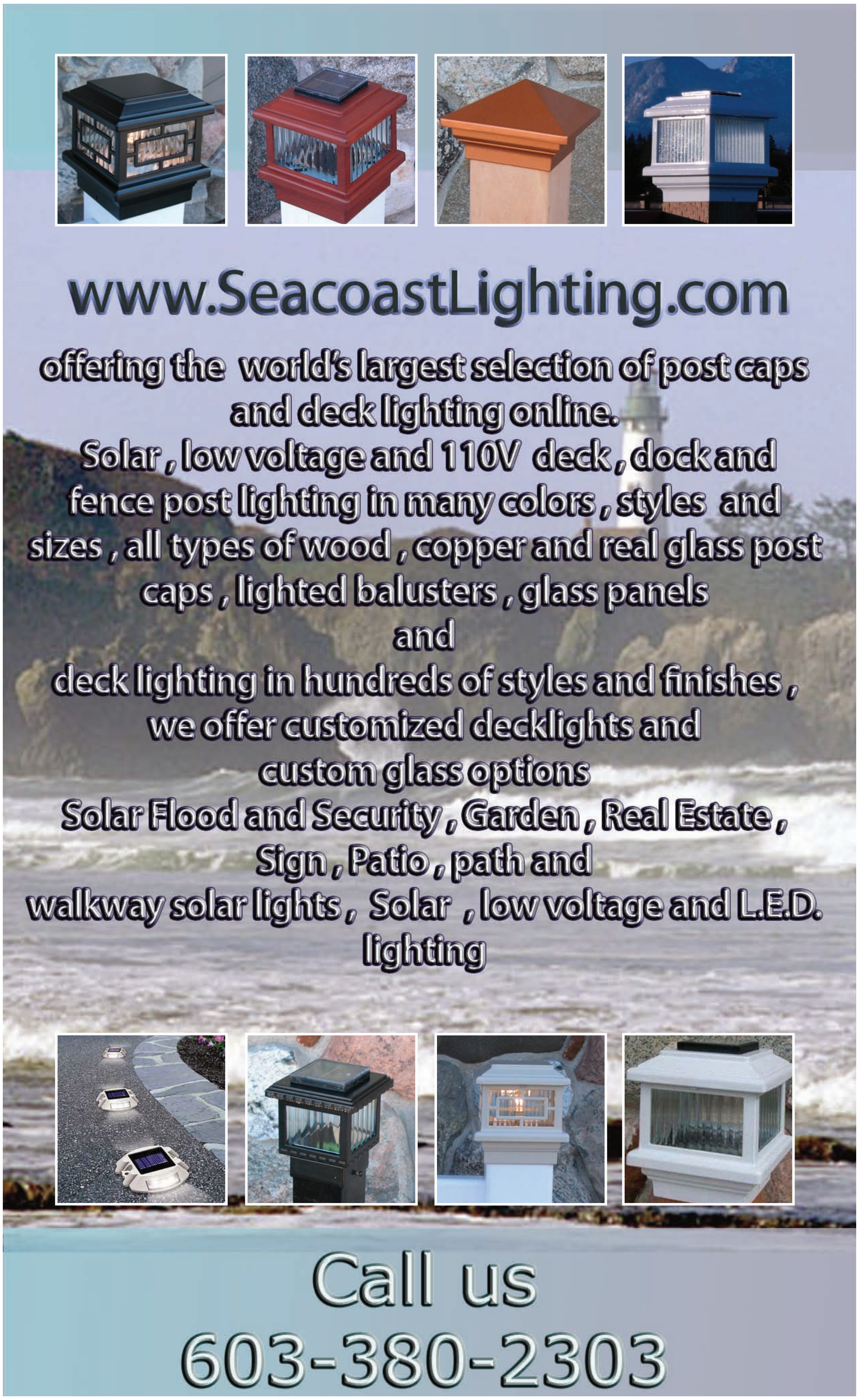
At each base, fasten two 6-inch 2-by-6 blocks to pack out the angle braces flush with the upright. Then, on either side of



Place the center stretcher over the closet sleeves and face-fasten through the upright. As an added measure, pop a few screws down into the sleeve.



Install the center shelf.



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As an added measure, or to support a shelf destined for long term use, slap a 2-by cleat (I admit I chamfered the corner a little for effect) over the middle shelf and fasten from below.

the stretcher, fasten 8-inch blocks as shelf supports.

Measure and mark 48 inches up from the base for your closet pole (galvanized steel electrical conduit).

Then, 1-1/2 inches down from the top, fasten a 2-by-4 stretcher on edge to each upright (again, a helper helps here). Place a 2-by-6 stretcher on-the-flat across the top. Face-screw through the upright.

Next, make and install closet pole sleeves, and pole (see sidebar, page 80).

Using the top of the sleeves as a cleat, install the second 2-by-6 stretcher, again, on-the-flat. Note: If this will be a long-term or permanent shelf—or exposed to a lot of humidity that can sag engineered material—I recommend installing a 2-by-4 cleat above the center shelf and fastening the shelf to it from the underside.

Cut and install plywood shelves. Fasten with drywall screws. To save a few bucks, I used 5/8-inch underlayment. It's

DISASSEMBLY

If you're using the Storage Solution Rack as a temporary measure, you'll be taking it apart. The key to safe disassembly without dropping pieces in a finished room is to reverse the order it was assembled. This includes holding the uprights fast as you take the stretchers off. The pieces are tall, can fall over, or otherwise get away from you. If your head is on that collision course, it is likely to hurt more than an ouch.

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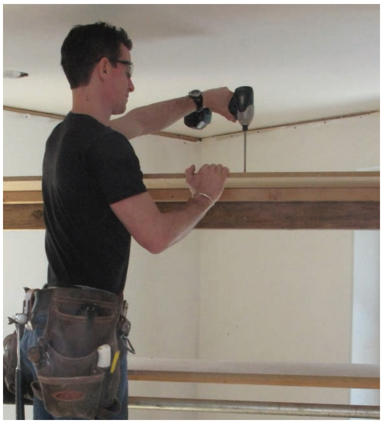
If you have absolutely nowhere to store items during a room remodel, this Storage Solution Rack still works—you can use it right in the room under construction; just be sure to wrap it in plastic to keep the dust off. And because it is mobile—even when loaded—you can move it around as necessary. How custom a solution is that? It's even better that I can repeat this technique on other projects. And last but not least, I was able to keep and reuse all that 2-by material, which keeps me rolling. And that's the name of the game.

massively dense and heavy as far as sheet goods go, but it is inexpensive as far as sheet goods go, too. And, despite what I said earlier about blowing this together, I couldn't resist routing a nice edge to ease the hard corners of the shelf stock. **EHT**

Editor's Note: *Mark Clement is a live-action tradeshow demonstrator, remodeler, and author of The Carpenter's Notebook, A Novel. Visit www.FormalFarmHouse.com.*

I know what I said about blowing this together, but I sometimes can't help trying to make things just a tweak nicer, so I zapped a router profile on the underlayment just to ease the edge.



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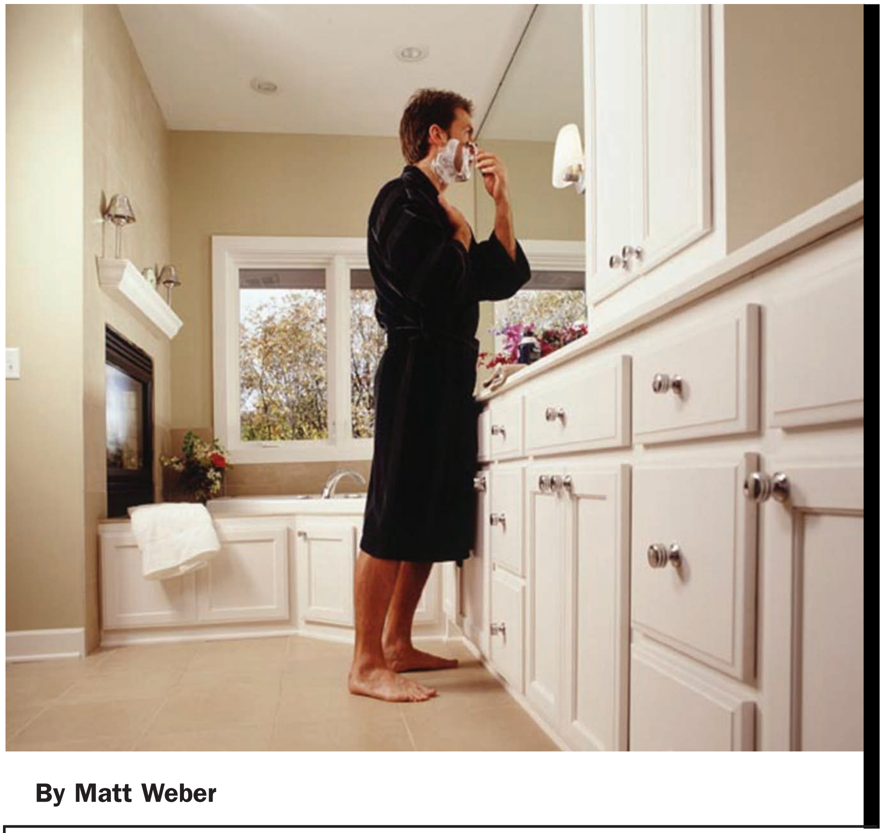

The direct heat of a radiant floor works on a similar principle as standing in the sunlight on a chilly day.

By Matt Weber

Heat rises, and a source of heat at your feet is a great way to stay warm and comfortable. Rather than using air currents, radiant heat floor systems provide direct heat, similar to standing in the sunlight on a chilly day. When the entire floor is heated, it becomes a large radiating surface that generates heat outward to all areas of the room. When compared to forced-air heating, these radiant floors can reduce a home's energy usage by 25 to 30 percent, according to the Radiant Panel Association, a trade organization for the radiant heating industry.

In addition to direct heat, radiant systems offer several key benefits. They consume less energy, which is good for the environment, and produce less dust than forced-air systems. Silent operation is another bonus. Plus, today's systems have simple yet incredibly smart controls that can target and maintain the level of comfort in specific areas of the home.

Hydronic systems utilize flowing hot water to provide the floor's pervasive warmth. Such systems generally feature underfloor piping that carries hot water across the floor. Most of these systems are installed in new-construction applications, although in some cases they can be retrofitted during a remodel. Hydronic systems can be powered by gas, oil, electricity or solar energy, making them both flexible and economical when used for whole-house applications. They can also go under most types of flooring, including wood, carpet, stone, tile and laminates.

STRENGTH IN TUBING

Years ago, hydronic systems were built with metal tubing placed in a concrete slab. Unfortunately, as the concrete shifted and cracked over time, so did the pipes. Today, most modern hydronic systems are made of cross-linked polyethylene (PEX) or rubber tubing, which can take more stress and strain than the metal tubing used in older systems. The cross-linking process makes the tubing very strong at high temperatures, and the flexible plastic moves with the natural movement and settling of the house, without leaking or cracking.

The hydronic tubing is usually embedded in a concrete slab or a 1-1/2-inch-thick concrete overlay on top of a wood floor. However, the tubing can also be suspended in the space below

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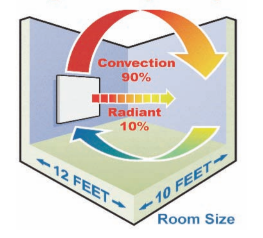
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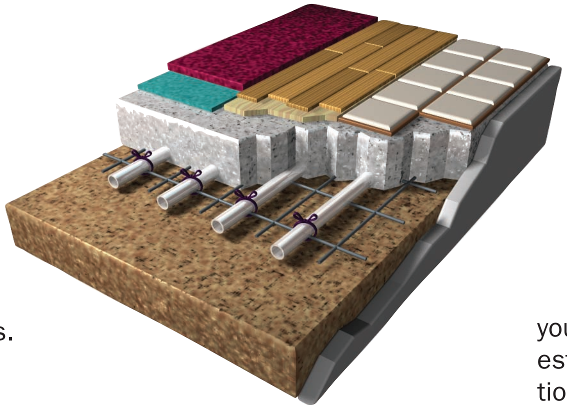

Hydronic systems are often installed during new construction and embedded in a concrete slab. Photo courtesy Uponor.

wooden floors or stapled on top of subfloors. Almost all tubing for hydronic systems is guaranteed for 25 years, with a lifetime expectancy of 100 years.

The water is then sent through the tubing via a circulator pump. Additional materials such as manifolds, mixing valves, expansion tanks and thermostatic controls are designed into the system to fine-tune the heat for optimum comfort.

Before a radiant system is installed in your house, the contractor or system supplier must calculate the amount of heat that your house will lose on the coldest day of the year in your location. This heat loss is expressed in terms of BTUs or British Thermal Units. The system is then designed so the heat output from the radiant floor exceeds the heat loss from the house.

THE DIRECT APPROACH: HOW RADIANT FLOORS HEAT THE HOME

Every home—no matter how well insulated—is constantly losing heat to the outside, and forced-air heating systems are constantly working to replace this lost heat. Similarly, our bodies also lose heat to the colder objects that surround us. Heat always flows toward cold, and this loss of body heat causes us to feel chilly.

Radiant floor systems work so efficiently because they directly heat objects in the room instead of just the air in the room. This direct heat warms you, the floor, the sofa, the recliner, the kitchen table, etc. Since these objects are warmer, they don't sap as much heat. The end result is an overall feeling of warmth and comfort. In fact, the air temperature in the room can be considerably lower if your body is in a room full of warm objects, and you'll still feel very comfortable. Many people who use radiant heat lower their thermostats to 65 degrees and feel more comfortable than they did when setting their conventional heating system to 70-72 degrees.

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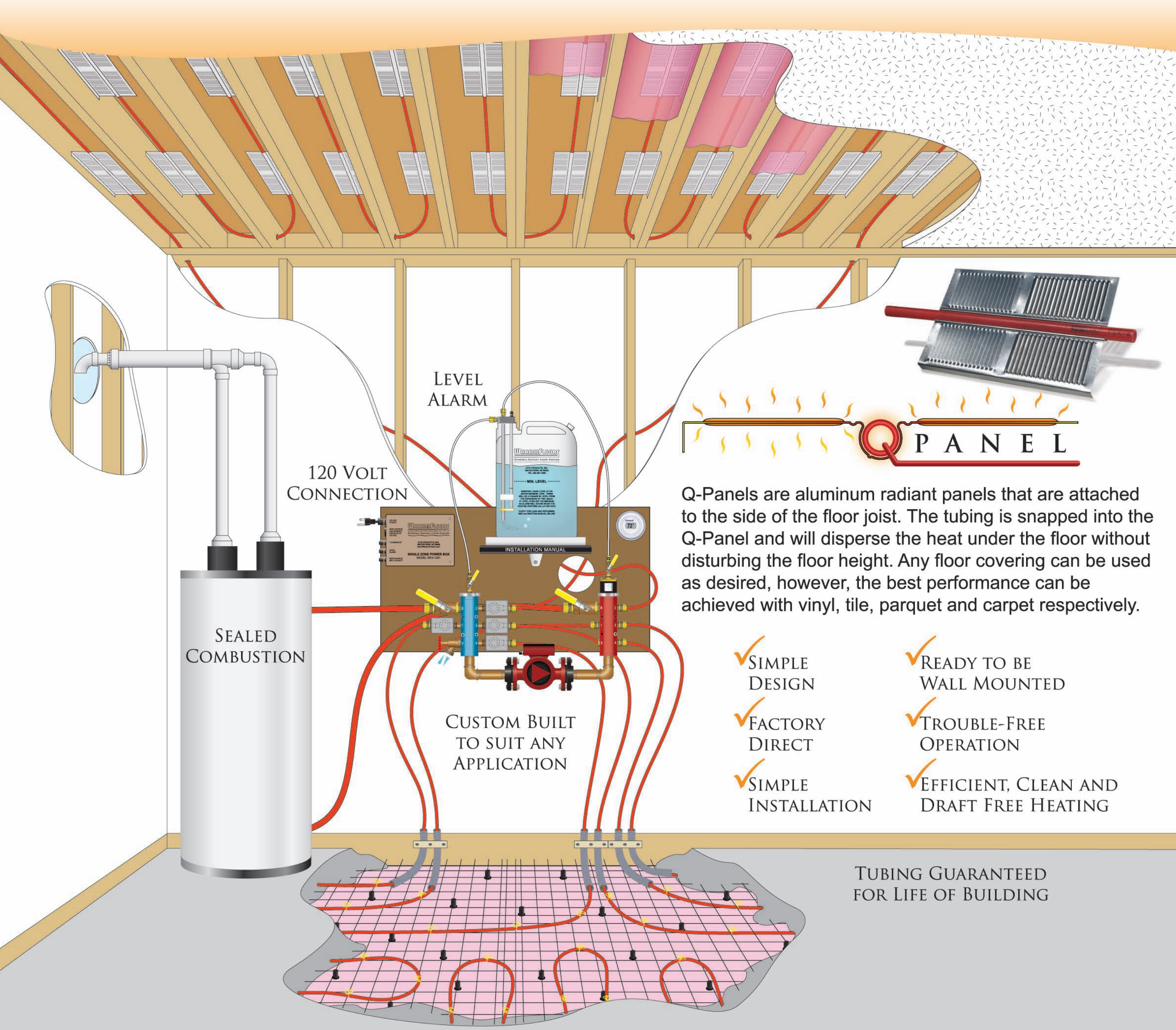
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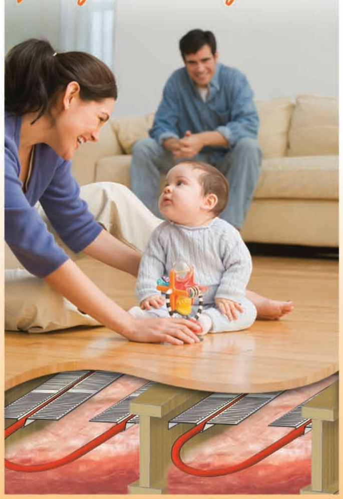

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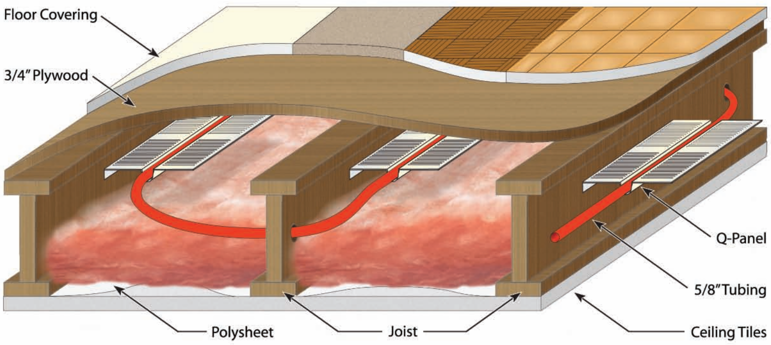
This is accomplished through a combination of tubing spacing and water temperature.

OUTDOOR APPLICATIONS

Homeowners residing in colder climates know what a big problem snow accumulation can be. Thanks to hydronic radiant heating, you can say goodbye to slipping and sliding on icy sidewalks and shoveling snow. Even in moderate climates, the location of a sidewalk, driveway or patio beneath the shade may encourage snow or ice accumulation. Radiant tubing with antifreeze can melt the accumulation, making these highly trafficked surfaces safe and dry for visitors and family members. Embedded in the concrete, these snow-melting systems can be installed alone, or as a component of a larger radiant system.



In some cases, hydronic systems can be installed beneath floor joists. Photo courtesy WarmmFloors.com.

For those cold-weather homes, a roof de-icing system may be another smart investment. Freeze/thaw conditions can form ice dams and icicles around eaves, drains and valleys, which cause structural damage and leaking. Snow accumulation can also create a heavy weight load on roofs. Some de-icing systems use PEX tubing to transfer heat to a customized aluminum panel. De-icing systems are available for all types of applications, including new construction, remodeling and existing roofs.

Whether they're used for melting snow or warming floors, hydronic radiant systems do a great job of efficiently heating the living space throughout the long months of winter. For more information, contact the Radiant Panel Association at www.radiantpanelassociation.org. EHT

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Typically, whole-house heating systems from **Hannel – RadiantDirect** come in at $3 - $4 per sq. ft….. before installation. ***We specialize in complete radiant heating systems for homeowners, contractors or plumbers to install.***

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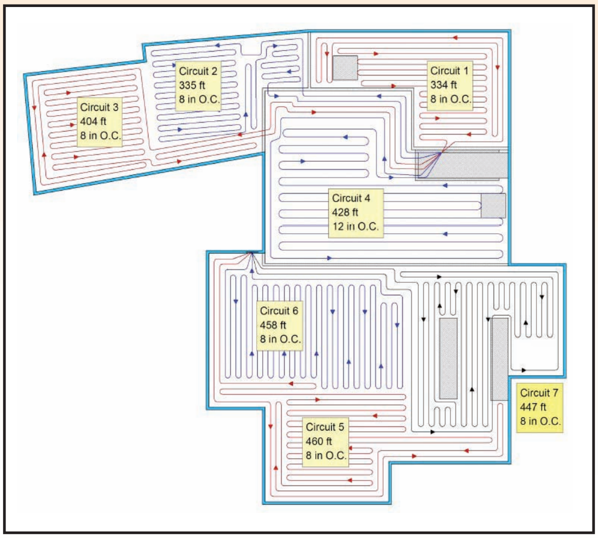
Circuit 3
404 ft
8 in O.C.
Circuit 2
335 ft
8 in O.C.
Circuit 1
334 ft
8 in O.C.
Circuit 4
428 ft
12 in O.C.
Circuit 6
458 ft
8 in O.C.
Circuit 7
447 ft
8 in O.C.
Circuit 5
460 ft
8 in O.C.

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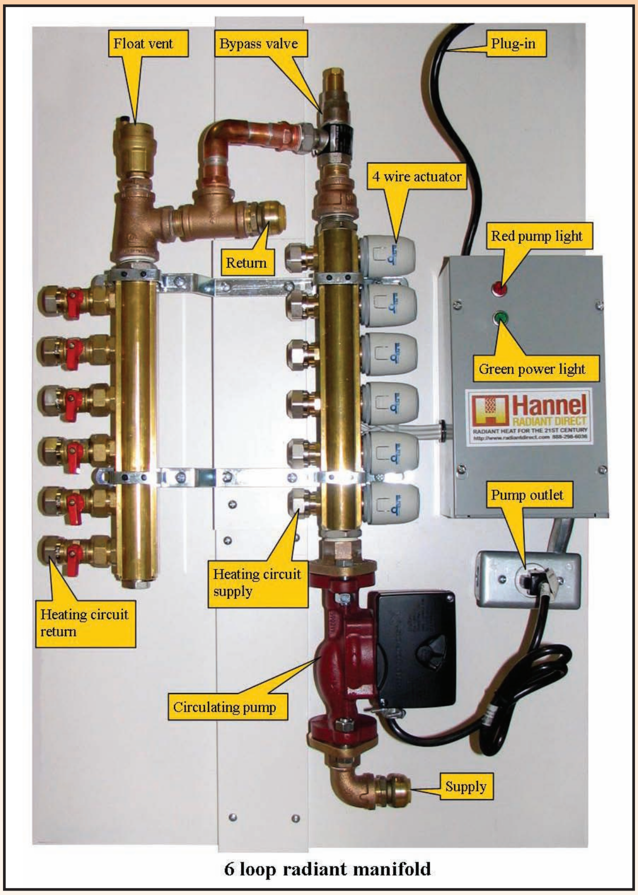
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Plug-in
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CHECKLIST FOR A HYDRONIC SYSTEM

If it's your first time dabbling in radiant heat, or you just want to be sure it's done right, then you should get a loop CAD (Computer Aided Design) of your tubing system drawn by a Radiant Certified Designer. The CAD maps out the installation of your tubing system throughout the home, including the various system components. A loop CAD with a materials quote is $75 from PexSupply.com. Other materials and components of an in-slab hydronic heat system include:

ThermaPEX Tubing. A hydronic system uses cross-linked polyethylene tubing with an oxygen barrier. It is flexible enough to bend easily and strong enough to be approved by all major plumbing and heating codes.

Manifold. The manifold is the hub of a radiant heating system, connecting to the supply and return lines with as many ports as you have loops of tubing. If more than 12 loops are in a system, multiple manifolds may be necessary.

Circulator Pump. The system requires a quality pump to circulate the water throughout the system. If there won't be potable water involved, a cast-iron pump is a cost-efficient way to get the job done.

Check Valve. This valve ensures that water can only flow one way through the system.

Mixing Valve. Boiler water cannot go directly into the hydronic radiant system. The water must be mixed with cold water, sending 180-degree F water to heat your floors.

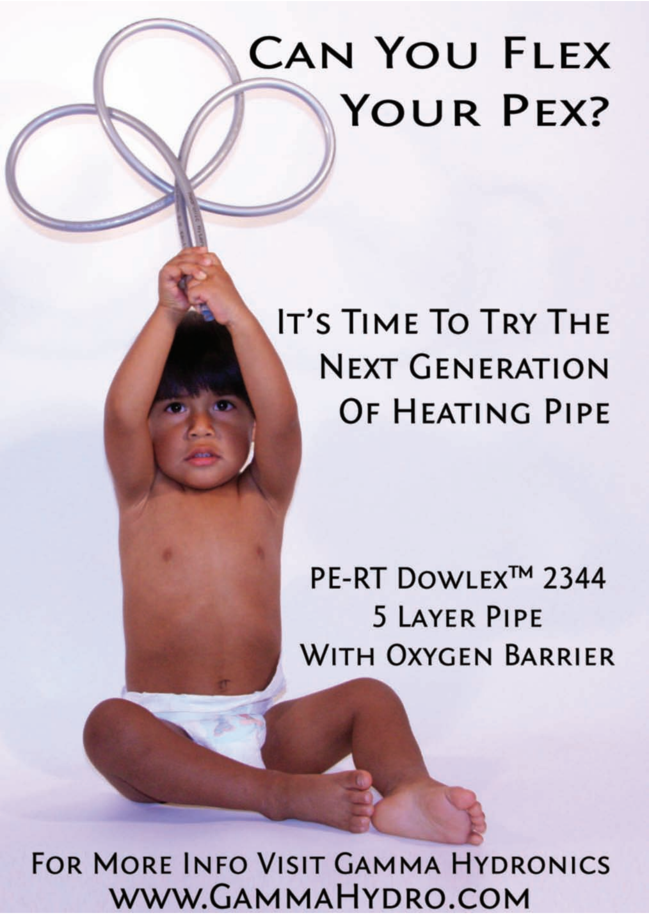
Thermostat. The interface between you and your heating system, the thermostat will control when the heat is turned on and how long it stays on to achieve the desired temperature in the room.

Sensors. In-slab sensors will communicate to the thermostat the temperature of the slab, while floor sensors will communicate the surface temperature of your floors to prevent any gapping, cupping or warping due to excessive heat.

Expansion Tank. The expansion tank maintains proper pressure within the system.

Air Eliminator. This device removes all excess air from the system to ensure silence and a steady water flow during operation.

Special thanks to Liz Koch and www.pexsupply.com for providing this information.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Just Getting Started

Replacing the starter in a Ford SuperDuty

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CORE MUST BE RETURNED IN THIS BOX

By Larry Walton, Photos by Bruce W. Smith

Years ago when I had starter issues, I'd just park on a hill, or get a friend or two to give me a shove, and with a quick drop of the clutch we were off and running. Not so, today. Not only does my truck weigh 3-1/2 tons empty, it's an automatic. So when the starter quits working, the repair must be immediate.

HOME GARAGE DIAGNOSTICS

Now some of you are saying, "How'd you decide it was the starter and not something else?" Good question, especially since it takes so many automotive components to get a vehicle started.

OK, let's assume that the engine has everything it needs to run (fuel, air and spark—for gas engines—all happening in the right amounts and at the right time).

In addition the starting process is to get the engine turning. This is why hand cranks were used on the earliest cars, as well as why the "push start" method I described above works. They get the engine turning so the fuel/air mixture enters the cylinder and gets compressed for ignition, at which point the running process takes over for the starting process.

To get the engine turning by simply twisting the ignition key requires a good deal of electrical current turning a heavy-duty electric motor. This starter motor turns a pinion gear, which meshes with a ring gear on the flywheel or flex-plate to turn the engine.

Now, let's say your car doesn't start. The question remains, why not? If you turn the key and you hear nothing but perhaps some clicking, you probably have a dead battery. Even then, the problem could be corroded battery cables, a loose ground to the battery, a faulty connection to the starter, or an issue with the ignition switch.

However, if the starter is clearly turning the engine over, you could be missing fuel, air or spark. If the starter is making noise but not turning over the engine, you could have a starter issue at the pinion gear, or it could be missing teeth in the ring gear that connects the starter to the engine.

Narrows it right down, huh? In the case of my truck, I figured it wasn't a battery problem because I recently replaced the stock batteries. I thought of the ring gear, but figured it would be damaged in only one of the four positions that the engine usually stops, and this problem was too consistent for that.

Because the starter was turning but apparently not engaging well with the engine, even if it was a flex-plate ring-gear problem, we would want to replace the aging starter anyway. If we began with replacing the starter and it fixed the problem, we could consider the job done.

So that's what we did, that's how it played out, and here's how we did it.

GETTING STARTED

The first thing we did was procure a new starter. You can pick up one from the local parts store, but if you have a friend with an auto shop he may be able to get one for you at wholesale.

Next, we took the truck to my son Tim's shop where his buddies had left a mess doing an engine swap. After doing some shop cleaning, we pulled the truck in and let it chill.

Depending on the type of vehicle, a lift or jack stands would be handy, but my truck has enough room at normal ride height to work on the starter from a creeper.

We disconnected the battery ground cables (my F-250 has two batteries). This is an important step. The fat cables going from battery to starter should be fair warning that a good amount of juice gets directed to the starter leads.

Then Tim cleaned off the starter and the area around it. This is a good idea when you are doing some work overhead. Safety glasses are also very helpful, because every dislodged bit of dirt is going to drop straight down on your face.

After taking a quick look at where the wires connect to the starter assembly, Tim loosened the mounting bolts so he could remove and rotate the starter to get to the wire leads. This made disconnecting the wires quite simple.

CHECKING FOR TOOTH DECAY

With the starter out of the way, grab a flashlight and find an angle where you can see the teeth of the ring gear. Inspecting the condition of the ring gear is an important step in this install. Because this starter was having trouble engaging and disengaging the ring gear, damaged teeth on the ring gear was a distinct possibility.

The starter opening in the case allows you to see only a few teeth at a time. Tim used a breaker bar and a socket on the crank pulley to turn the engine over a little at a time while I watched the teeth of the ring gear.

Tim watched a timing mark on the crank pulley to make sure that he turned the engine a full revolution to give me a chance to see all of the teeth.

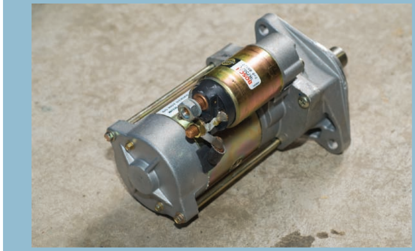
Having passed its ring gear inspection, the truck was ready for the new starter. As is often the case, putting things back together in reverse order of taking them apart usually works best. In this case, Tim made the electrical connections on the starter before final positioning.

Perhaps the most critical aspect of the starter install is making sure that the flat surfaces of the bell housing and starter flange meet flush all the way around. Firm pressure on a normal ratchet should be all the torque you need.

With the starter secured, reattach the battery ground cables. Make sure all tools are removed from the engine bay as well as from under the vehicle.

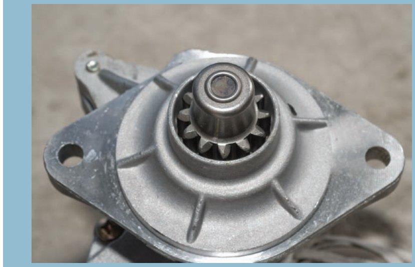
Turn the key. In our case, the starter replacement solved the problem. The truck started without complaint, and we were off to return the original starter core to the parts store for our core charge refund.

STEP-BY-STEP



Pay attention to instructions for returning the starter core, including the warning that the core must be returned in the new starter box.

The starter and the solenoid, the smaller cylinder, are sold as a unit. The solenoid is the largest of several relay switches in your car. The ignition switch operates this large remote switch, which in turn connects/disconnects power to the starter.

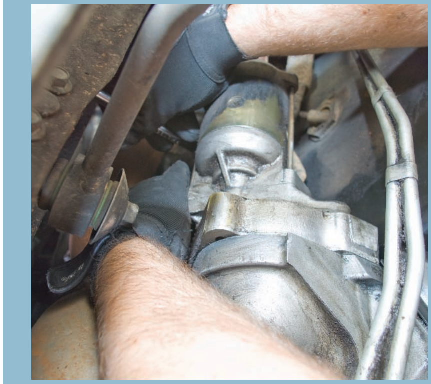


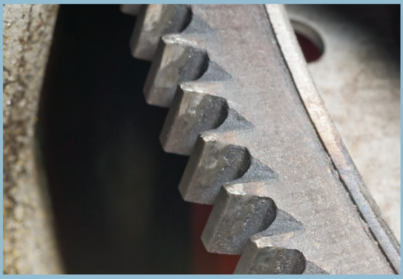
This pinion gear at the end of the starter shaft is what meshes with the ring gear on the flywheel or flex-plate.

Disconnect the ground wire from the battery.

You may need to reach around the starter and go by feel to get one of the two bolts out. You can examine the yet-to-be-installed new starter for bolt locations to

STEP-BY-STEP

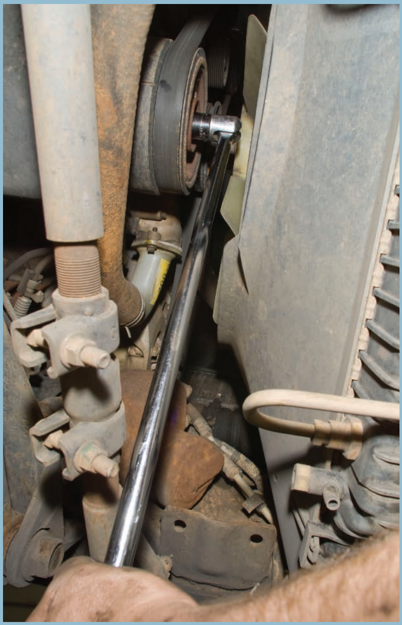




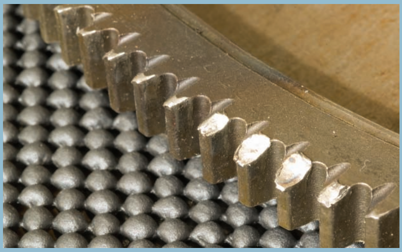
help you visualize what you can't see.

With the bolts out, slightly twist and tip the starter and pull it out until the pinion gear clears the engine casing. Then you can see and reach the wire connectors for removal.

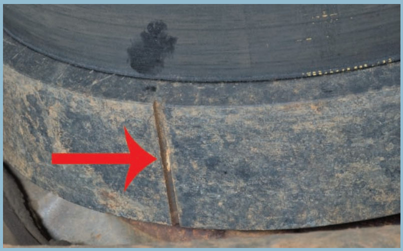
Teeth on the starter gear mesh with the ring gear, which is attached to the engine via the flex-plate. You should inspect the condition of the ring gear when changing the starter.



We used a breaker bar and socket to turn the crank at the crank pulley so we could turn the engine a full revolution while inspecting the condition of the ring gear.



This ring gear shows some abuse from the starter. We replaced it when we installed the Banks billet torque converter a few years ago.



Tim kept an eye on this timing mark on the crank pulley to make sure he'd gone a full revolution. **EHT**

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Lookin' Snappy

Snap-Together Garage Floor Tile is Quick and Easy to Install.

By Matt Weber

It's simple to install an interlocking floor tile system for a sweet garage floor, workshop, basement, patio and more. These highly durable floor systems, such as the Swisstrax brand pictured here, provide a highly non-slip and extremely attractive garage flooring that will look great for years to come. These systems add some much needed décor to a lifeless concrete slab floor, provide safe traction and are easy to clean. Interlocking garage floor is available in a wide array of colors and textures from suppliers such as JNK products (www.jnkprodcuts.com). The style shown here is the Swisstrax Diamondtrax pattern in a checkerboard layout with alternating gray and silver tiles.

These heavy-duty polypropylene tiles each have five interlocking tabs where the edges join the other tiles. The floor system is quick to install and creates an attractive, non-slip, solid surface with a 12-year warranty—and it's guaranteed not to stain.

To install the garage floor, clear away all obstructions and sweep the floor thoroughly. Use 1/4-inch spacing boards at the perimeter of the walls and obstacles such as beams to allow for expansion. After the tiles have been conditioned to room temperature, start in a corner and place the "smooth" edges toward the wall. Place the next tile against the locking edge, interlocking the pegs under the second tile with the loops on the edge of the first. Continue working in one direction until the first row is complete.

If you only have room for a partial tile at the end of the first row, you may opt to center that row along the wall, and cut two matching partial tiles to bookend the row for a more symmetrical appearance. Cuts can be made with a standard circular saw, jigsaw or table saw. Then complete two more rows so you have the first three installed with enough weight and traction to hold the layout in place.

Use 1/4" spacer boards against the walls to create an expansion gap.

Next, install the next three rows along the wall adjacent to the first three, working toward the door of the garage. Install the interlocking beveled edging along the end of the three rows,

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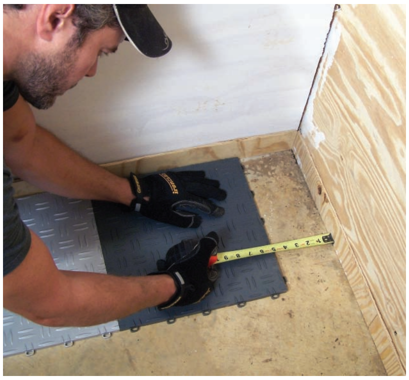
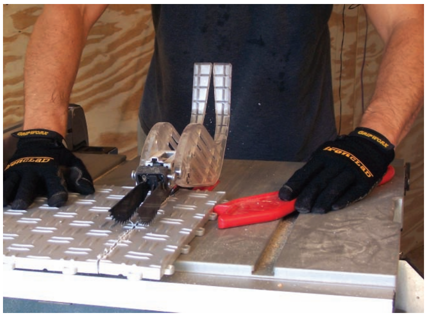
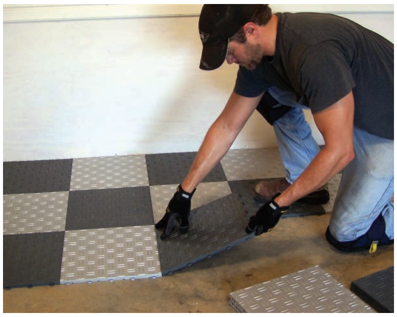
making sure the garage door can close clear of the edging and tile. Then continue working throughout the floor, completing the field by snapping it in place tile by tile. The interlocking edges keep everything square and uniform for a great-looking finished project. **EHT**



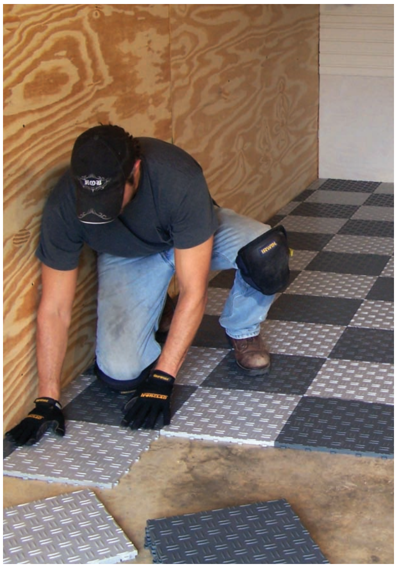
For a symmetrical layout, center the first row and cut partial tiles for each end.



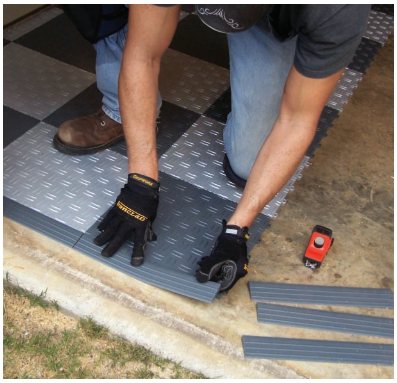
Tiles can be cut with a table saw, circular saw or jigsaw.



The tiles snap together easily along the edges.



Install rows 4 through 6 along the adjacent wall toward the garage door.



Install beveled edging at the end of the floor, staying clear of the garage door.

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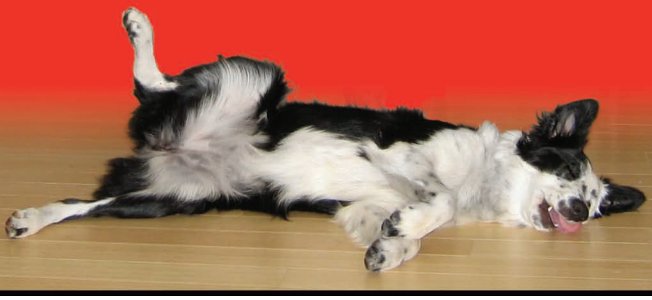

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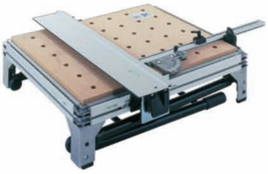

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THE DON

The 24-ounce Maxistrike hammer, dubbed "The Don," represents the heavy-duty end of the Redback Tools range and is perfect for DIY jobs that require a bit of brute force, such as framing. The Don has a patented, curved handle that is designed to reduce the "aftershock" and strain caused by hammering. The manufacturer claims the shock-absorbing handle allows the user to deliver up to 50-percent more power with each strike. The *EHT* staff put the hammer to use on a wide array of around-the-house projects, and the unique handle does indeed let you give it more powerful "whack" than normal, without noticeable discomfort from the impact. This degree of comfort can greatly pay off during long jobs that require hammering all day. The hammer is drop-forged in a factory certified to international standard ISO9002, and the head is double tempered for extra hardness. Redback Tools are available online at www.RedbackTools.com

STANLEY TAPE MEASURE

Did you know that Stanley Tools now offers personalized tape measures? The *EHT* staff didn't realize this until Stanley sent us a cool FatMax tape measurer that was "Made exclusively for *Extreme How-To*." This would make a great Christmas present or "anytime" gift for a tradesperson or DIY'er. The Stanley FatMax features an 11-foot standout capacity, an easy-to-read 1-1/4-inch blade, and the BladeArmor coating on the first 4-1/2 inches maximizes the life of the hook end. The high-impact ABS case has a rubber overmold for extra protection, and a cushioned grip makes it comfortable and slip-resistant to hold. Visit www.stanleytools.com.

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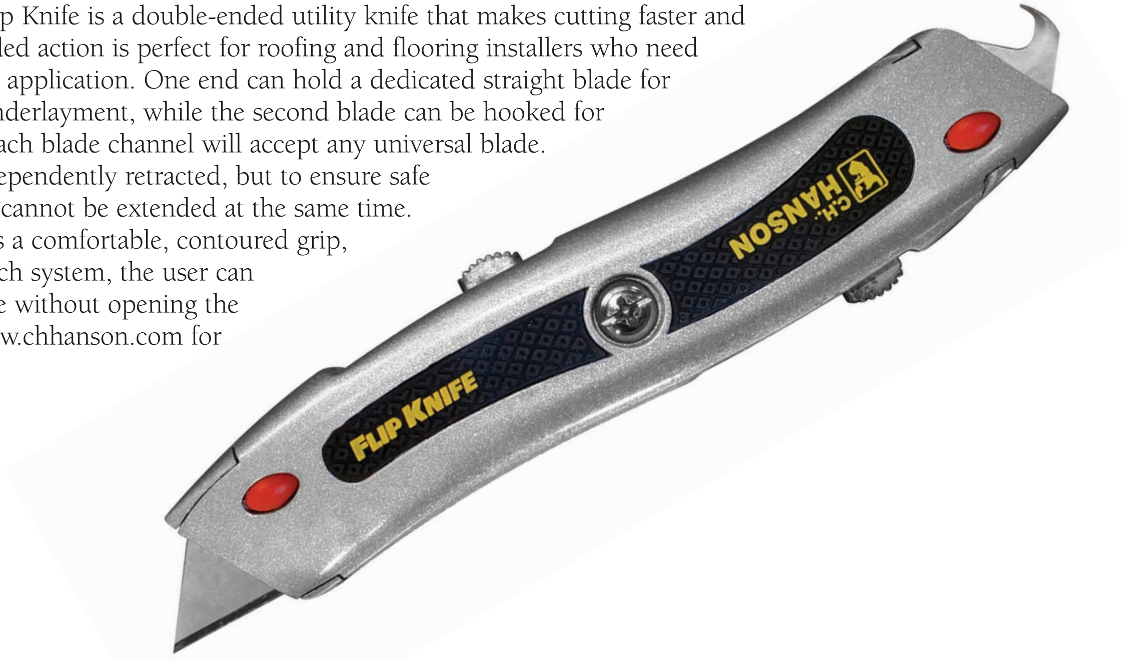
DOUBLE-BLADED FLIP KNIFE

C.H. Hanson's new Flip Knife is a double-ended utility knife that makes cutting faster and easier. The double-ended action is perfect for roofing and flooring installers who need special blades for each application. One end can hold a dedicated straight blade for cutting tar paper or underlayment, while the second blade can be hooked for shingles or flooring. Each blade channel will accept any universal blade. The blades can be independently retracted, but to ensure safe operation both blades cannot be extended at the same time. The Flip Knife features a comfortable, contoured grip, and with the One Touch system, the user can easily change the blade without opening the knife handle. Visit www.chhanson.com for more information.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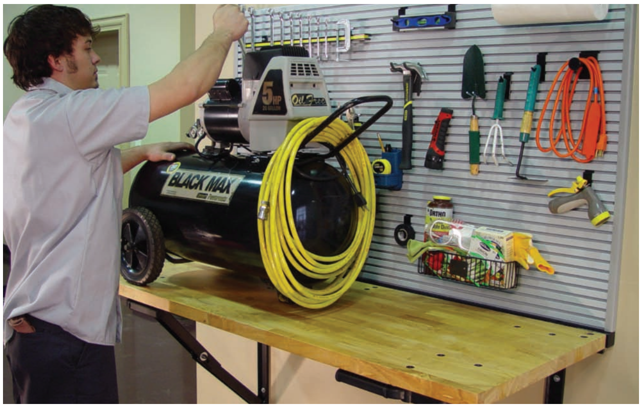
The IdealWall Solution, sold separately, is the perfect companion. It's a uniquely engineered polymer wall panel with the flexibility of using both pegboard hooks and accessories in combination with "L" style brackets for use in the garage, home or office. The dimensions align perfectly at 60-inches by 36-inches with uniquely engineered vertical grooves, which allow tools to be placed close together so no space is wasted. For more information, visit www.2benchsolution.com or call (319) 330-0336.



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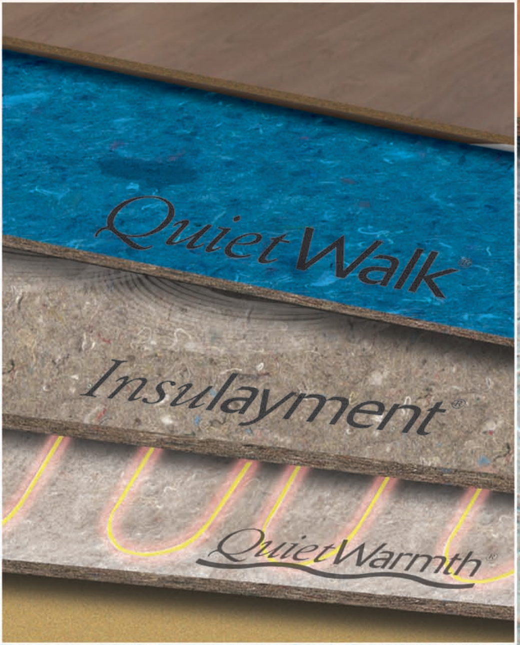

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